U.S. Department of the Interior
Bureau of Land Management

Klamath Falls Resource Area
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Klamath Falls Resource Area Resource Management Plan and Environmental Impact Statement

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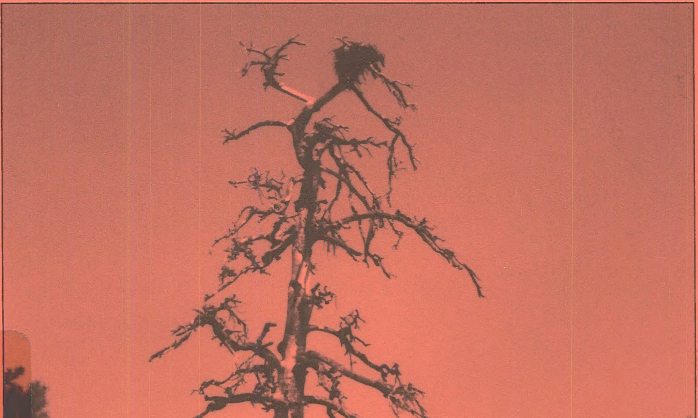

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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U.S. Department of the Interior

Bureau of Land Management

Draft
Resource Management Plan/
Environmental Impact Statement

for the

Klamath Falls Resource Area

Prepared by

Klamath Falls Resource Area Office
Lakeview District
August 1992

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Acronyms

ACE	Allowable Cut Effect
ACEC	Area of Critical Environmental Concern
ACMP	Area of Critical Mineral Potential
ADS	Automated Digitizing System
AMS	Analysis of the Management Situation
AMP	Allotment Management Plan
AQMA	Air Quality Management Area
ARD	Automated Resource Data
ASQ	Allowable Sale Quantity
AUM	Animal Unit Month
BLM	Bureau of Land Management
BMP	Best Management Practices
BR	Bureau of Reclamation
BRU	Basic Resource Unit
BS	Bureau Sensitive (species)
CDWR	Critical Deer Winter Range
CEQ	Council of Environmental Quality
CFR	Code of Federal Regulations
CMAI	Culmination of Mean Annual Increment
CRMP	Coordinated Resource Management Plan
DBH	Diameter at Breast Height
DEIS	Draft Environmental Impact Statement
DEQ	Oregon Department of Environmental Quality
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ERMA	Extensive Recreation Management Area
ESA	Endangered Species Act
ESC	Existing Stand Condition
FC	Federal Candidate (species)
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FLPMA	Federal Land Policy and Management Act
FY	Fiscal Year
GIS	Geographic Information System
GRU	Group Resource Unit
HCA	Habitat Conservation Areas
HMP	Habitat Management Plan
IDT	Interdisciplinary Team
IMPLAN	Input Model Plan developed by the U.S. Forest Service to measure the economic effects of changes in program-related activities.
IPM	Integrated Pest Management
ISC	Interagency Scientific Committee
KFRA	Klamath Falls Resource Area
KGRA	Known Geothermal Resource Area
LTSY	Long-Term Sustained Yield
MBF	Thousand Board Feet
MCF	Thousand Cubic Feet
MFP	Management Framework Plan
MHA	Minimum Harvest Age
MI	Management Intensity

MMBF	Million Board Feet
MMCF	Million Cubic Feet
MOSS	Map Overlay and Statistical System
MOU	Memorandum of Understanding
MTP	Master Title Plat
NA	No Action (alternative)
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge
NWSRA	National Wild and Scenic Rivers Act
OAR	Oregon Administrative Rules
O&C	Oregon and California Act of 1937 (Revested Oregon and California Railroad and Reconveyed Coos Bay Wagon Road Grant Lands)
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
OEDD	Oregon Economic Development Department
OFPA	Oregon Forest Practices Act
OGEA	Old Growth Emphasis Area
OI	Operations Inventory
ONA	Outstanding Natural Area
ONHP	Oregon Natural Heritage Program
ORS	Oregon Revised Statutes
ORV	Off-Road Vehicle
ORV	Outstandingly Remarkable Values (for wild and scenic rivers)
OSMP	Oregon Smoke Management Plan
OSU	Oregon State University
PA	Preferred Alternative
PCNST	Pacific Crest National Scenic Trail
PCT	Pre-Commercial Thinning
PD	Public Domain
PM	Particulate Matter
PHA	Protected Habitat Area
PHAB	Protected Habitat Area Buffers
PL	Public Law
PNC	Potential Natural Communities
PNW	Pacific Northwest Research Station
PPM	Parts Per Million
PSD	Prevention of Significant Deterioration
R&R	Retention and Restoration (blocks)
RMIS	Recreation Management Information System
RMA	Riparian Management Area
RMP	Resource Management Plan
RNA	Research Natural Area
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
ROW	Right-of-Way
RTMS	Ten-year Representative Timber Management Scenarios
SC	State Candidate (species)
SCS	Soil Conservation Service
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SIP	State Implementation Plan
SL	State Listed (species)
SRMA	Special Recreation Management Area
SSF	Soil Surface Factor
SYU	Sustained Yield Unit

T&E	Threatened and Endangered (species)
TMDL	Total Maximum Daily Loads
TPCC	Timber Production Capability Classification
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USDA	U.S. Department of Agriculture
USDI	U.S. Department of the Interior
VRM	Visual Resource Management
WODDB	Western Oregon Digital Data Base
WRD	Oregon Water Resources Department
WSA	Wilderness Study Area

Appendices

Chapter 1
Appendix

Appendix 1-A. Legal Guidelines

The following statutes and executive orders (as amended) constitute the major legal guidance for planning and management of lands administered by BLM in western Oregon. This list is not necessarily all inclusive but does represent the primary legal guidance to be considered in preparation of the Resource Management Plan.

Federal Land Policy and Management Act of 1976 (FLPMA)	43 USC 1701
The O&C Sustained Yield Act of 1937	43 USC 1181a
National Environmental Policy Act of 1969 (NEPA)	42 USC 4321
Environmental Quality Improvement Act of 1970	42 USC 4371
Executive Order 11514, Protection and Enhancement of Environmental Quality (1970)	
Taylor Grazing Act	43 USC 315
Recreation and Public Purposes Act	43 USC 869
Unlawful Inclosures or Occupancy Act	43 USC 1061
Mining and Minerals Policy Act of 1970	30 USC 21a
Mining Act of 1872	30 USC 26
Mineral Leasing Act of 1920 (Mineral Lands Leasing Act)	30 USC 181
Materials Act of 1947	30 USC 601
Geothermal Steam Act of 1970	30 USC 1001
Geothermal Energy Act of 1980	30 USC 1501
Antiquities Act of 1906	16 USC 431
Historic Sites, Buildings, and Antiquities Act	16 USC 461
National Historic Preservation Act	16 USC 470
Archaeological Resources Protection Act of 1979	16 USC 470aa
Reservoir Salvage Act of 1960	16 USC 580m-n
Fish and Wildlife Coordination Act	16 USC 661
Bald Eagle Protection Act	16 USC 668
Sikes Act	16 USC 670a
Migratory Bird Treaty Act	16 USC 703
Migratory Bird Conservation Act	16 USC 715
Wilderness Act	16 USC 1131
National Trail Systems Act	16 USC 1241
Wild and Scenic Rivers Act	16 USC 1271
Executive Order 11644, Use of Off-Road Vehicles on the Public Lands (1972)	
Executive Order 11989, Off-Road Vehicles on Public Lands (1977)	
Wild Free-Roaming Horses and Burros Act	16 USC 1331
Coastal Zone Management Act of 1972	16 USC 1451
Endangered Species Act of 1973	16 USC 1531
Soil and Water Resources Conservation Act of 1977	16 USC 2001
Executive Order 11988, Floodplain Management (1977)	
Executive Order 11990, Protection of Wetlands (1977)	
Coastal Barriers Resources Act	16 USC 3501
Land and Water Conservation Fund Act of 1965	16 USC 4601-4
Federal Water Pollution Control Act/Clean Water Act	33 USC 1251
Safe Drinking Water Act	42 USC 300 (f)
American Indian Religious Freedom Act	42 USC 1996
Resource Conservation and Recovery Act of 1976	42 USC 6901
Clean Air Act	42 USC 7401
Comprehensive Environmental Response, Compensation and Liability Act of 1980	42 USC 9601
Emergency Planning and Community Right-to-Know Act of 1986	42 USC 11001

Appendix 1-B. Portions of *Record of Decision, Northwest Area Noxious Weed Control Program*

The following is verbatim from the *Supplemental Record of Decision, Northwest Area Noxious Weed Control Program* of May 5, 1987. (The remainder of the Supplemental Record of Decision, including the Rationale, is incorporated by reference):

The Decision and Its Specific Provisions

To control or eradicate noxious weeds, BLM will use six commercial products containing herbicides: Banvel, Rodeo, Tordon 22K, Tordon 2K, Esteron 99 and DMA-4. These formulations contain different herbicides designed to kill or retard the growth of noxious weeds: dicamba in Banvel; glyphosate in Rodeo; picloram in Tordon 22K and Tordon 2K; and 2,4-D in Esteron 99 and DMA-4.

BLM will use the herbicide formulations as part of its ongoing program for controlling or eradicating noxious weeds. BLM has been using three methods. If noxious weeds are susceptible to insects, pathogens, or grazing by goats or sheep, BLM may introduce those biological agents to retard weed growth. BLM may also use laborers to manually remove noxious weeds and apply mechanical treatment—burning, mowing, and tilling. With this record of decision, BLM may use the herbicide formulations as a fourth technique.[1]

The provisions governing the use of Banvel, Rodeo, Tordon 22K, Tordon 2K, Esteron 99 and DMA-4 to control or eradicate noxious weeds parallels the features stated under Alternative I in the FEIS, Chapter I; the SEIS, Appendix I; and BLM policy statements and manuals referred to in those documents. The word "parallels" is used because the decision in several instances differs from the original proposal by requiring the more judicious use of the substances to avoid or minimize environmental effects of their use.

BLM will apply Banvel, Rodeo, Tordon 22K, Tordon 2K, Esteron 99 and DMA-4 only in accordance with the standards that the Environmental Protection Agency (EPA) imposes upon their public use. These standards are stated on the product labels.

BLM will use the commercial products only if the noxious weeds targeted for treatment are susceptible or highly susceptible to their herbicides. What this means is that the commercial products' herbicides, with one treatment, can retard at least 85 percent of the growth of the targeted noxious weeds. BLM will not use herbicide formulations if another method is more effective.

The herbicide formulations may be applied by helicopter; by ground vehicles equipped with boom or hand-gun sprayers; or by workers with backpack sprayers, broadcast cyclone sprayers, or tools for hand wiping the substances onto the plants.

Ordinarily, two considerations govern the choice of method. The choice first depends upon the treatment objective, topography of the treatment area, expected costs, and equipment limitations. The second consideration is the selectivity of the herbicides. Since Rodeo, which contains glyphosate, is not selective in the plants it kills or retards, it may be applied only from the ground to the noxious weeds targeted for treatment. And because the other herbicide formulations are toxic to conifer seedlings, the same restriction applies to how these herbicides are applied if conifers are being grown as commercial timber on the site to be treated. The restriction does not apply once the conifer seedlings become dormant, usually in the late summer. Unless conifers are present, the herbicides in Banvel (dicamba), Tordon 22K and Tordon 2K (picloram), and Esteron 99 and DMA-4 (2,4-D) may be applied by any method.

In applying the herbicide formulations, BLM will also abide by the following measures to reduce environmental impacts. None of the products may be applied within 500 feet of any residence or other place of human occupation unless the occupant or resident gives his consent in writing. Commercial products will not be applied within l00 feet of any croplands or by helicopter within l00 feet of any surface waters or identified ground water recharge area. Nor will the commercial products be applied by ground vehicles equipped with boom sprayers within 25 feet of any waters. Spot treatments with vehicle-mounted handguns or with backpacks will not be applied within 10

[1]BLM will not use products containing dicamba, glyphosate, picloram, and 2,4-D on public lands administered by its Oregon State Office until the court dissolves its injunction in *Northwest Coalition for Alternatives to Pesticides v. Block et al.*, No 83-6272-E (D. Ore. 1984).

feet of water. Herbicides will be wiped on individual plants up to the current water line and will be applied by helicopters only when wind velocity does not exceed 5 miles per hour. Wind speeds may not exceed 8 miles per hour under any other herbicide application method.

Certain restrictions also govern the equipment used to apply the formulations. Spray nozzles on all helicopters and ground vehicles must be set to produce spray droplets with a median diameter of 200 microns or larger. Helicopter and ground vehicle equipment must also operate with a boom pressure of 20-35 pounds per square inch, unless the herbicide's label specifies a different pressure. Aerial applications must be within 100 feet of the ground. Backpack applications of liquid formulations will be allowed only with low nozzle pressure and within 2.5 feet of the ground. Granular formulations will be applied by broadcast spreaders only within 3.5 feet of the ground.

One final set of restrictions governs the maximum amount of the herbicides in each of the commercial products that may be applied. The FEIS, as modified by the SEIS, includes a table showing the maximum rates of application. BLM's proposal was to apply dicamba at 6 pounds per acre, glyphosate at 3 pounds per acre, picloram at l pound per acre, and 2,4-D at 3 pounds per acre. If, however, small animals susceptible to dicamba or 2,4-D are on the site to be treated and represent sensitive wildlife species in the area, BLM will not use these substances if glyphosate or picloram can be used instead. Or, if that is not possible, BLM will substantially reduce the amount of dicamba or 2,4-D to be applied per application. In addition, BLM ordinarily will apply the commercial products only once a year to any site and, except under circumstances where control or eradication goals are not achieved, no more than three times during the program's span.

The provisions governing BLM's use of herbicides in this program require measures to mitigate possible environmental effects. More mitigation measures are included in the FEIS, the SEIS, and the policy statements and manuals they cite. All are incorporated by reference into this supplemental record of decision. The purpose of the mitigation measures is to ensure the judicious use of the herbicides.

BLM projects that it will annually use the herbicide formulations to control or eradicate noxious weeds on about 21,300 acres of the public lands in the Northwest: 7,800 acres in Idaho, 5,600 acres in Montana, 6,600 acres in Oregon and Washington, and 1,300 acres in Wyoming.

BLM will treat public lands infested or potentially threatened by noxious weeds according to a set of priorities, which are detailed in the SEIS, page 119. The priorities represent BLM's commitment to pursue all existing methods for controlling or eradicating noxious weeds, including the use of herbicide formulations, with no undue reliance on any one means. The priorities detailed in the SEIS are part of this decision.

The following is verbatim from the original Record of Decision of April 7, 1986. (The remainder of the Record of Decision is incorporated by reference):

Management Emphasis

To give definition to the integrated management called for by this decision, the Bureau also shall treat public lands infested or potentially threatened by noxious weeds according to a set of priorities. The priorities are three-fold: (1) prevention, i.e., stopping noxious weed species from being introduced onto public lands; (2) eradication, i.e., halting the spread of noxious weeds by eradicating invading noxious weeds; and (3) control, i.e., limiting well established infestations competing with desired vegetation. The remaining program direction on setting priorities for treatment largely represents a paraphrase of the consensus reached in Idaho between the BLM State Office there and affected interests.

Priority I and II - prevention and eradication of new invaders. Prevention is often the most practical means of controlling noxious weeds. This priority shall be accomplished in part by educating public land users, and where possible, conditioning their use in a way that improves the chances that new weed seeds are not carried onto public lands. The agency's first treatment priority shall be stopping a given species from contaminating an area. More concretely, priority in treatment shall be given to those areas that noxious weeds have newly invaded. Eradicating new invaders shall have highest priority in treatment and funding.

Priority III - control. Weed species in this treatment priority are those that have become so established that for all practical purposes eradication is not feasible. Under this priority, noxious weeds will be treated for the purpose of reducing the population to a level that restores an area's ecological balance and productivity. The amount of control must be balanced between the costs involved and the prospect for success. Components of this category include: (1) emphasis will be placed on containing and preventing further spread of the infestation; (2) highest priority will be given to "breakouts" from the infested area and along rights-of-

way or adjacent to private property; and (3) biological agents, when and where available, will be emphasized on main infestations when the agent demonstrates practical effectiveness against the weed.

Program Design Features

To give further definition to the Bureau's program, and recognizing that the available techniques carry different costs, efficiencies and environmental risks, the decision adopts the program design features from the EIS (Appendix I and Chapter 1) for deciding upon and governing use of a particular technique. In stating the design features, the agency does so to make personnel charged with implementing the program aware of the concerns and

constraints about using different means. the design features are to strengthen and supplement the judgement of qualified agency professionals who have on the ground knowledge and familiarity with local conditions and needs.

Four chemicals are authorized for use under this decision. They are 2,4-D, picloram, dicamba, and glyphosate. Other or new herbicides could be proposed for use in the future, but before their use, all required environmental analysis, including a hazard assessment similar to that in Appendix K of the EIS, will be conducted and appropriately documented.

The Bureau will use the herbicide to which the targeted weed species is most susceptible and will be of lest detriment to non-target vegetation.

The chemicals may be applied individually or in combination. Glyphosate, picloram, dicamba and 2,4-D will be applied only when in accordance with the Environmental Protection Agency's label and registration restrictions. All safety requirements and project features described in Appendix I of the EIS will be followed. All application methods may be used for each herbicide except glyphosate; it will not be applied aerially.

Conditions indicating preference for a particular method of application are as follows:

- Applications using backpack spraying, hand wiping and cyclone broadcast spreading (granular formulations only) will be used in areas not accessible by ground vehicles. Treatment area will generally range in size from individual plants to a few acres.

- Applications using a vehicle mounted boom or handgun will be used in areas readily accessible by vehicle. Booms are used to treat continuous weed concentration areas (i.e., along rights-of-way) while handguns are used to treat concentrated spots.

- Aerial applications will be accomplished using helicopters to treat larger contiguous areas, but normally not exceeding 100 acres in size.

Minimum buffer strips will meet or exceed state-mandated standards for all herbicides applied.

- In aerial applications a 500 foot unsprayed buffer strip will be left next to inhabited dwellings unless waived in writing by the resident. A buffer strip of 100 feet will be left next to cropland and barns.

- Boom sprayers will not be used within 25 feet of water bodies.

- Granular formulations will be applied no closer than 10 feet from the high water line of streams and other water bodies.

- Contact systemic herbicides wiped on individual plants may be used up to the existing high water line.

Wind velocities for chemical applications of herbicides must be 10 mph or less in all instances. Where aerial applications of liquid herbicides are utilized, the wind speed must be 5 mph or less. Where vehicle and hand applications of herbicides are used, the wind velocity must be 8 mph or less except in riparian areas where the wind speed must be 5 mph or less.

Spray nozzles are designed for aerial and ground vehicles spray equipment to produce droplets large enough (200 microns or larger) in order to limit the amount of drift. Aerial application equipment will normally operate with a boom pressure of 20 to 35 pounds per square inch, unless the product label specifies a different pressure. Backpack application of liquid herbicide will occur with low nozzle pressure and within 2.5 feet of the ground surface. Applications of granular formulations through use of broadcast spreaders occur from about 3.5 feet above the ground.

Four major methods of manual and mechanical control are authorized for use under this decision. These are hand pulling and using hand tools, tillage, mowing and controlled burning.

- Hand pulling and using hand tools to remove noxious weeds may be used when no other

means is available to control or eradicate the targeted noxious weed.

- Tillage, either by burial or disturbing the root system, to control or eradicate noxious weeds may be used under these circumstances:
    - slope does not exceed 10 percent.
    - nontarget species adversely affected represent an insubstantial amount of vegetation cover or forage for wildlife.
- Mowing may be used to control or eradicate noxious weeds under these circumstances:
    - the targeted noxious weed lacks rosettes or rhizomes and fails to produce seed heads close to the ground.
    - the targeted noxious weed is easily accessible by vehicles.
- Controlled burning may be used to control or eradicate noxious weeds under these circumstances:
    - the targeted noxious weed represents the vast majority of plants in the treatment area.
    - the burn is in accordance with BLM's Fire Management Policy (BLM Manual 9210).
    - the burned area can be rehabilitated to prevent erosion and resource degredation.
    - burning permit, when required, must be obtained.

Biological agents will be considered for use where they have demonstrated practical effectiveness in controlling the target noxious weed species. This does not preclude the use of biological agents from an experimental standpoint.

Each biological agent must be cleared for use on the targeted noxious weed as required under Executive Order No. 11987 (May 24, 1977). The following conditions are the most favorable for successful biological control.

- The biological agent is highly selective and will only affect the weed species intended for control.
- The mobility of the biological agent is sufficient to allow spread among the targeted weed community.
- The development of populations of biological parasites should be able to overtake the population of the target weed species.
- Biological agents used in a particular area or region of the targeted noxious weed should be able to adapt and be capable of surviving and reproducing.

Mitigation Measures

A number of mitigating measures which exceed standard BLM requirements, have been identified in the Environmental Impact Statement and are adopted by this Record of Decision. The program design features just announced also can be thought of as mitigating measures. In addition to the measures governing chemical treatments announced in the project design feature section here and the EIS, the following provisions also apply.

1. Due to the low no observable effect level (NOEL) for reproductive effects from Dicamba, female applicators will be restricted from working with Dicamba.

2. Due to the lowered margin of safety for the mixer loader from accidents, the mixer loader will wear a full length apron, face shield, rubber gloves, and liquid repellant footwear during the mixing and loading operation.

3. To prevent gross errors in the field in mixing, regular testing on field calibration and calculation will take place.

4. Due to the remote nature of the treatment areas, sufficient clean water will be available on the sprayer mixing and project sites to assure the opportunity for workers to wash off any chemicals splashed inadvertently onto skin.

To reiterate, all chemicals will be applied only when it is in accordance with EPA standards specified on the herbicide's label.

Monitoring and Studies

Table 1 summarizes the major monitoring activities which will be conducted under the decision. The purpose of the monitoring plan is to ensure that implementation occurs as planned and to ascertain the effectiveness of project design features and mitigation measures in meeting planned objectives. Information gained from monitoring will also be used to develop an improved data base from which to build future plans.

Much of the monitoring will be accomplished through normal operating procedures such as contract administration and staff review. Special systems have been developed to measure the biological and physical impacts of plan implementation. For example, control effectiveness will be monitored by post-treatment surveys designed to measure the actual effectiveness of a treatment or combination of treatments. When appropriate, monitoring will include recommendations for additional treatment and/or site rehabilitation.

Implementation and Additional Analysis

This Record of Decision is the next followup program step after completion of a final EIS. The process includes selection of the best alternative, or combination of alternatives, which in this case is Alternative 1. The decision becomes effective upon signature and issuance of this ROD, and BLM will proceed to implement the decision.

The EIS is a regional programmatic statement for controlling noxious weeds on BLM-administered land in Idaho, Montana, Oregon, Washington, and Wyoming and is intended to guide this program for the next 10-15 years. Site-specific environmental analysis and documentation (including application of categorical exclusions where appropriate) will be accomplished at the district level on proposed weed control plans. During site-specific analysis and documentation, public involvement will occur in accordance with the CEQ Regulations for implementing NEPA. Interdisciplinary impact analyses will be based upon this and other EISs, such as resource management plan, timber management plan, and grazing management plan EISs.

If analysis finds potential for significant impacts not already described in an existing EIS, another EIS or a supplement to an existing EIS may be required.

Table 1-A-1. Monitoring Plan

Monitoring Element	Method	Frequency	Characteristics Evaluated
Pretreatment Survey	On site visual inspection	Each treatment area	Species present, density endangered species present, control options, method chosen
Post Treatment Survey	On site inspection	Each treatment area	Effectiveness, need for retreatment, corrective measures or mitigation
Pesticide Use Proposal	Review of proposal and EPA registration by authorized certified applicator.	Prior to any herbicide application	Proposal compared to EPA registration requirements and ROD compliance
Water Monitoring Samples	Pre and post treatment water samples when program is near potable sources and could get into water.	As needed	Potential water contamination
Coordination Monitoring	Weed management plans submitted to Washington D.C.	Yearly	Coordination of plan
Biological Establishment	Survey of biocontrol agents release and establishment	State/District yearly	Establishment, effectiveness, and rate of spread of biological control agents.
Threatened and Endangered Surveys	Survey for T&E species prior to action	Each project	Presence of T&E species
Cultural Resource Surveys	Survey for archeological and historical resources	Each project which involves surface disturbance	Presence of cultural resources

Appendix 1-C. Key Sections of 1992 *Record of Decision on the Western Oregon Program - Management of Competing Vegetation Environmental Impact Statement*

The Decision

In managing competing and unwanted vegetation, the BLM's Decision is to combine features from the eight original alternatives to implement integrated vegetative management, emphasize a preventive strategy, reduce reliance on herbicides, and maintain the flexibility to potentially use all available treatment options in western Oregon. The Decision provides western Oregon-wide program guidance for the vegetation management program in a manner that is flexible for addressing site-specific variables occurring in the resource areas in the Cascade, Coastal and Klamath Provinces in western Oregon.

The BLM has given considerable analysis to the formulation and selection of the Decision features, weighed the risks associated with its implementation against the risks and severity of possible adverse impacts, evaluated public comments, consulted with professionals including accredited toxicologists, analyzed the process involving the USFS mediation document and their implementation guide, solicited public input on the FEIS, and released a draft ROD for public review and comment.

As the FEIS provided, the Decision combines features from the original alternatives in the FEIS, identifies a vegetative management process, specifies project design features and mitigating measures. The Decision emphasizes planning and monitoring, employing a preventive strategy, and reducing reliance on herbicide use.

Important distinctions specific to this approach are as follows:

- A judicious approach to vegetative management through systematic (sequential) program and site-specific planning and analysis where vegetation manipulation is expected to be needed.

- Development of action thresholds for plant communities with the intent of defining conditions that trigger potential needs for corrective treatments, anticipating competition problems, and assisting in monitoring activities. Involves verifying appropriate thresholds for local conditions and effectiveness of the prescription and techniques.

- A specified limit on yearly potential herbicide acreage available to reduce reliance on herbicides.
- Pursuit of adequate funding to make alternative treatments feasible.

- Recognition that herbicides, their formulations, and application techniques vary widely in their potential health effects, and that these decisions should be made on a site-specific basis with the risks of each method and their potential exposures being an important part of the Job Hazard Analysis and risk assessment.

A cap is placed on herbicide treatment in western Oregon in any one year; it will not exceed 8,800 acres. This Decision will retain the current emphasis for the BLM to continue its search for nonchemical methods of vegetative management when control is needed.

Another important part of the Decision is the acceptance of the qualitative risk assessment of BLM Appendix L done by the University of Washington (USFS 1988 FEIS, Appendix H), which was reserved in the FEIS until development of the Final ROD. Acceptance of the qualitative risk assessment signifies its incorporation into the FEIS and this ROD. This qualitative risk assessment addresses the quality of the data underlying the quantitative risk assessment.

The potential impacts of the Decision are within the scope of impacts discussed in the FEIS for the eight alternatives and the significant aspects of their environmental consequences.

Scope of the Decision

This FEIS and ROD apply to all BLM-administered land in the Coos Bay, Eugene, Medford, Roseburg, and Salem districts, and the portion of the Lakeview District previously within the Medford District prior to 1987. Further, the decision applies only to the portion of each activity that pertains to management of competitive and unwanted vegetation. Excepted from the decision is noxious weed control which is analyzed in a separate document, the Northwest Area Noxious Weed Control Program EIS (1986).

The Decision approach is to emphasize the use of prevention and natural processes to manage compet-

ing and unwanted vegetation. The decision applies to vegetation management planning and control activities, and sets guidelines and standard operating procedures for implementing such programs.

Treatment options available for consideration in the integrated management program include biological, manual, prescribed fire, mechanical, and chemical methods and techniques. In forest land management programs, these treatments are often essential for the establishment and maintenance of desired plants and for achieving good growth rates of desired vegetation to meet management goals. While controlling competition is key to both of these objectives, the manner in which adequate control of competitive vegetation is achieved varies. It is the variability, need, and manner of manipulation to ameliorate harmful competitive or unwanted vegetation that must be identified, analyzed and communicated on a site-by-site basis.

Planning and implementation of activities on a site-specific project basis will be done according to the NEPA process, and correlated with guidance set forth in this FEIS/ROD and approved land use plans. Site-specific projects may be planned and analyzed on either an individual or group basis.

General Provisions

The focus is two-fold: (1) To prevent or minimize the need for future vegetation management or corrective action and also subsequently the need for later treatments, and (2) To emphasize the use of preventive and natural processes.

The Decision is designed to protect human health and promote long-term productivity of the forest ecosystem while meeting the goals and objectives of management plans for such activities as timber production, habitat management, and maintenance of both transportation systems and recreation sites.

It combines a number of features from the eight original alternatives when corrective action is needed, minimizes impacts on air quality from prescribed fire, and reduces the potential for adverse human health effects.

To facilitate ongoing public involvement, the Decision provides for an interactive review of the vegetation management process throughout planning until project implementation. A public consultation process is also defined.

Guidelines for implementing the Decision are as follows:

- *Ecological relationships will be emphasized in designing program activities to meet land management objectives (such as timber harvest, roadside maintenance, wildlife habitat restoration).*
- *Human health risks to the public and workers will be evaluated to determine major design features.*
- *Where prevention is no longer a viable option, effective early treatment and alternatives to herbicides of special consideration are to be given priority.*

Vegetation Management Process

Definite steps recognized in the vegetative management process are as follows:

Step 1
Site analysis determines site conditions and potential needs for treatments according to objectives for the site.

Step 2
Strategies are evaluated to select the best planned course of action to implement a preventive approach, in the long term at a minimum.

Step 3
Project design for proposed treatment is developed which includes mitigating measures, public involvement, risk management, monitoring, and predicting of vegetation response.

Step 4
Vegetative management action implemented.

Step 5
Monitoring initiated to determine if course of action taken was effective and if further action is needed to promote the preventive approach.

Important Concepts to the Process

Concepts integral to the vegetation management process for the preventive approach include Integrated Pest Management, Prevention, Thresholds, and

Scheduling of Detection and Action as described in the following sections.

Integrated Pest Management (IPM)

"IPM is a systems approach to reduce pest damage (competitive and unwanted vegetation) to tolerable levels through a variety of techniques, including natural predators and parasites, genetically resistant hosts, environmental modifications and when necessary and appropriate, chemical pesticides." (BLM M-9220) For clarity, the decision expands the IPM definition in the FEIS glossary to reflect the generic definition. Further, for consistency, this definition will be used in all BLM western Oregon vegetation management planning and implementation.

IPM generally relies upon a combination of strategies, treatment options and techniques as preventive and corrective defense mechanisms against competitive and unwanted vegetation. When initiated early IPM can avoid vegetative management problems and, when needed, employ a variety of methods and techniques.

The BLM recognizes that the success of IPM is dependent upon several factors: knowledge of vegetative management strategies; a broad range of specific technical skills; planning, monitoring and implementing of multiple interactive steps over a fairly long time frame; potentially-high initial capital investments (e.g., mowers in roadside vegetative control); and consistent funding. Without the development of a vegetative community strategy, and without the planning that considers both single and sequential steps and treatment options, it is common for timing to be short between problem identification and action, and for there to be a lack of the available skills, workmonths, and funding to achieve the objectives. In the latter instances, and when unexpected situations occur, corrective or rescue actions are necessary to meet management objectives; IPM is then limited to selecting control alternatives or no action.

In view of the importance of an effective IPM program to the prevention strategy, the BLM will strive to have appropriate resources available. The BLM will encourage research on specific forest ecosystems and continue analysis on a site-by-site basis, linking these necessary steps to implement effective IPM programs and enable vegetative manipulation that avoids or reduces competitive and unwanted vegetation to acceptable levels. The BLM will also continue to support research towards gaining a thorough knowledge of the requirements of competitive and unwanted vegetation, and of the needs and vegetative growth characteristics of desired vegetation. Any actions that are similar or cumulative should ideally be anticipated during project planning stages and used to determine both the need and timing for control efforts under an IPM program.

Prevention Strategy

A key to implementing the Decision is the major emphasis on prevention as the priority strategy being accomplished through planning, to identify and take advantage of any situations where competitive or unwanted vegetation may not interfere with objectives, or to reduce the need for corrective actions.

In the context of the Decision, the term "prevention" will mean "to detect and ameliorate the conditions that cause or favor the presence of competing or unwanted vegetation in the forests. Prevention is in contrast to treatment, which refers to activities for controlling or eradicating infestations of competing or unwanted vegetation. It also should not be confused with early treatment, which refers to activities for controlling or eradicating existing, small infestations of competing or unwanted vegetation before they interfere with the agency's objectives for managing that area or adjacent lands." (USFS, Med. Doc., 1989.)

Emphasis is on prevention and then early action if action is needed. Other strategies include no action, correction, maintenance, and rescue and restoration. The potential for prevention or another strategy to achieve the goals for a given site will be analyzed prior to commencing any sequence of treatments.
The concept of prevention as a planned course of action in forest management has continued to develop and gain emphasis during the past decade as an accepted vegetative management strategy. It was a scoping issue in 1982 at which time it was proposed that such practices be considered under all alternatives and used whenever feasible.

Thresholds Concept

Determining damage and action thresholds is an important part of determining the need for action during the vegetation management analysis process. Thresholds are a measure of the degree or level of competition which depletes environmental resources to the disadvantage of a desired plant.

The appropriate timing of vegetation manipulation should involve determining both damage and action thresholds for control of competitive and unwanted vegetation. Damage thresholds refer to the levels of

vegetation abundance where there is a marked decrease in rate of the desired plants' survival and growth.

There appear to be two separate thresholds: one for tree survival and establishment, and another for growth maintenance and release. A survival damage threshold may have a competitive vegetation density level many times greater than the levels desired for optimal growth (free-to-grow), at least for short periods. Also, adequate growth often infers far less than that for "free-to-grow" status.

Because plant communities are a complex aggregation of plants and animals, the thresholds need to be identified and tested for efficacy and dose response at the plant community, or on a more localized level, and over various time periods including periods of drought and adequate moisture. Variance of floristics, dominance, growth habits, and succession from site-to-site may indicate a need for intensive vegetative control in some locations and during some time periods, yet very little control in other years and locations. Meeting the management objectives and maintaining forest health for one or more similar sites is the key to determining thresholds and selecting a vegetative management approach.

Determination of competitive thresholds give managers a better analytical approach in making choices about treatment need, treatment method, technique efficacy, and seedling performance on similar or comparable sites. It will also help determine the appropriate degree of tool intensity necessary to attain an expected level of plantation performance (Wagner et al 1989; Radosevich, et al 1990 New Zealand). To emphasize effective preventive strategies, the BLM will continue developing, modeling, testing, and evaluating appropriate thresholds for action on a plant or ecological community basis.

Scheduling of Detection and Action

Because planning is essential to the prevention strategy, it is necessary to document site evaluations, develop a time-line for the occurrence of expected problems if action is prescribed, and use a pretreatment survey to verify if action is expected to be implemented. Strategies such as planning to avoid certain competitive conditions, developing alternative silvicultural schemes, and taking early action will generally minimize damage and often preclude further treatment.

The time to detect and ameliorate unwanted or competitive vegetation conditions is early in the project planning stages, before growth loss of desired vegetation becomes serious, and before major corrective action is required. This determination of need can occur during regularly scheduled surveys, project analysis, and young stand monitoring.

Priorities

Based upon the foregoing, BLM establishes the following vegetation management priorities in selecting and designing treatment methods to achieve site-specific management objectives:

Priority 1 - Plan at the earliest opportunity to detect and ameliorate conditions that cause or favor the presence of competitive and unwanted vegetation. Also, review data from past treatments of comparable sites to determine potential need and treatment effectiveness.

Priority 2 - Search for, and use, effective nonchemical methods of vegetation control and selective treatments when feasible. Manipulate the potential vegetation and timing of any prescribed actions to attain the desired conditions and minimize the overall need for control of competitive vegetation.

Priority 3 - Use herbicides only after fully considering the effectiveness of all reasonable treatment options, combinations with various methods of manipulation, and herbicide environmental effects, safety, human health risks (exposure), specificity, effectiveness, and their relative costs of implementation. This includes reducing both use levels and exposures to herbicide by employing application techniques and efficient formulations to improve effectiveness and selectivity, minimizing size of treatment areas, and where feasible combining the herbicide option within a mix of other treatments and methods for a program of integrated pest management.

Because not all potential problems develop and many that develop do not reach a threshold level, it may be appropriate for managers to defer action on some units or portions of units to see if problems do develop or if the potential is serious. Generally, however, whenever treatment is needed it is best to take the earliest available action identified to maintain adequate conditions and growth for desired plants. The earliest action often is to manipulate or reduce the problem vegetation while that vegetation is small and easy to treat.

It may not always be necessary to collect new data to respond to issues and evaluate alternatives strategies. Applicable information may be found in existing site records, or from other comparable sites.

Herbicides Available for Use

When herbicides are considered, BLM could use formulations that contain one or more of the following herbicides: asulam, atrazine, 2,4-D, dicamba, glyphosate, hexazinone, picloram, and triclopyr. These herbicides were analyzed for use in the FEIS, and in Appendices D and H which are incorporated into the BLM's FEIS. Use of these chemicals is subject to special mitigation measures summarized in this ROD, and the guidance provided in the Herbicide Profiles.

The selection of herbicides to use, along with the guidance provided in this ROD, recognized that some data gaps exist (see Chapter 6). However, in general, the data gaps occurred where initial experiments did not meet current standards. Also, see Appendix D which was prepared to address data gaps.

Herbicide Formulations and Inert Ingredients

The BLM encourages the use of the least toxic inert ingredients available and requires the disclosure of data necessary to determine conditions of safety before a product can be used.

The reason for this precaution is that most chronic tests of herbicides do not use the full formula, but test only the active ingredient. A high proportion of these formulations have "inert" ingredients which often are neither chemically nor biologically inert and may have substantial toxicity themselves (see Appendix H).

Accordingly, only those formulations that do not contain inert ingredients on EPA's List 1 and 2 will be used, unless the risk associated with the listed inert ingredients is evaluated and the formulation found acceptable. In addition to considering EPA information to judge and select the least hazardous inert formulations available for use, BLM will use publicly available manufacturers' data and request acknowledgement about List 1 and 2 inert ingredients.

Two inert ingredients of concern—kerosene and diesel oil (both petroleum distillates)—have been reviewed by the BLM. It was determined that kerosene and diesel oil would not add significantly to the potency of the formulations. Their use will, however, be subject to the following guidelines:

- Kerosene will not be used in herbicide applications except as an inert ingredient in the formulations of 2,4-D (Esteron) and triclopyr (Garlon 4).
- Diesel oil will not be used in herbicide applications as a carrier; however, diesel oil may be used as an adjuvant (not to exceed five percent of spray mixture) (USFS, Region 6 FEIS).

Herbicide Use Restrictions and Precautions

An annual cap of 8,800 acres is placed on herbicide use during the effective life of this FEIS to reduce reliance on herbicides. Herbicides will be used only when other methods are ineffective, or will increase project cost unreasonably. This decision does not infer that herbicides are ineffective or costly. Rather, this decision to limit herbicide use arises from a concern among many people, including professionals, about the use of herbicides.

Further, when selecting a herbicide, the BLM will use only those herbicides for which herbicide profiles are, or will be, available.

Although markedly less toxic than insecticides, herbicides must be handled and applied with care. This need for caution is the reason that EPA registers herbicides, the BLM conducts risk analyses for program and public risk and worker job hazard analysis on site-specific projects. Another precautionary measure in the use of herbicides is that the personnel involved in planning, applying, supervising, and reviewing herbicide applications must be certified.

Precautionary measures BLM will employ relative to all herbicide use include conducting periodic literature reviews by accredited toxicologists, providing information sheets for each of the herbicides approved for consideration, strictly adhering to label regulations, and thoroughly training its applicators in safety precautions as well as proper application technology.

Specific protective measures for herbicide use are provided in Chapter 5 and Appendix B. It should be recognized that further review may show that expanded use of herbicides is justified, or that further prudence is appropriate.

Herbicides of Special Consideration

Due to their known or uncertain adverse human health effects the herbicides 2,4-D, asulam, and atrazine will be placed in a Special Consideration Category requiring special precautions, consideration and analysis whenever they are proposed for use. This will include ensuring that all feasible effective alternatives are considered and protection measures such as aerial

restrictions, worker protection and posting and controlling access have been implemented. (See the section on Effectiveness of Practice in Meeting Objectives for a related discussion on selection of herbicides of special consideration.)

Asulam, atrazine and 2,4-D have either incomplete or highly conflicting information about their human health effects. All three have cancer potency values noted in the FEIS, as if they are associated with or are carcinogenic, and recent toxicological data continue to recommend a cautious and conservative approach. Atrazine has controversial and potentially high risk reproductive MOS values, especially for workers and is a confirmed ground water contaminate.

Due to the above, the application technique and placement of atrazine and 2,4-D will require additional controls. A risk management strategy for the public and a job hazard analysis for workers will be developed to assure high risk exposures do not occur.

Program Implementation

Program Design

Implementation of the vegetative management program has two parts: standard operating procedures and project design features. The standards are a list of important measures that are applied on a regular basis for the various types of vegetation treatment. Project design features are intended to ensure the proper and safe implementation of treatment methods, and are selected based upon site-specific analysis. Analysis of specific treatment areas may result in modification of the project design features, or the identification of others, to provide adequate protection to nontarget organisms and human health. Standard operating procedures are listed below, followed by a list of common project design features.

Standard Operating Procedures

Strategy

Use prevention and natural processes as the preferred strategy to manage competing and unwanted vegetation. Conduct planning and monitoring to anticipate, and take steps to avoid, potential vegetation management problems. When needed, plan corrective actions to occur early and timely as compatible with a long-term preventive strategy and natural disturbance and recovery pattern in the site-specific area.

Safety

Always consider the safety of both the general public and workers. This includes determining the degree of exposure, hazard and risk posed by various vegetation management treatment methods for forestry workers, forest users, and nearby residents.

Program-wide risk assessment will be conducted by the program leaders prior to any treatment where there is potential for direct or indirect effects on human health to evaluate human health exposure to any hazardous substances and injuries. Keep in mind that this preliminary analysis is about generalities, not site-specific instances. Low-risk or low exposure methods will be sought for implementation to minimize public exposure to injurious situations.

In general, the risk assessment process will involve three evaluation components: Hazard, Exposure, and Risk. These components and their interrelationship are described below:

Hazard Evaluation: Identify harmful characteristics of the proposed vegetation management methods.

Exposure Evaluation: Estimate the kinds and levels of exposure and doses likely to result from potential exposures under routine, worst case, and accidental scenarios.

Risk Evaluation: Combine hazard information with dose level exposures to predict the health effects under the given conditions of exposure.

These evaluations are conducted for two groups of people: the general public and the occupationally exposed. A Job Hazard Analysis (JHA) is used to anticipate site-specific human health effects. For the general public, evaluation is done for single exposures and exposures over a 30-year time period.

When considering potentially harmful situations in site-specific evaluations, estimate exposure by identifying: (1) who is being exposed, (2) when the exposure will occur, (3) where exposure would occur, and (4) the amount, duration, and frequency of exposure. These estimates should then be compared to the average conditions found in the FEIS risk assessment and used to determine design and adequacy of mitigating measures.

The "amount" of exposure is the actual quantity or level of a substance that comes in contact with an individual. "Duration" is length of contact, and "frequency" is the number of encounters with the substance. Other

factors to consider in exposure analysis include proximity (distance) to human habitation, water source, or potential food stuffs, and recreation use patterns, weather conditions, and access to site.

All employees active in vegetation management will be trained in the safe use of prescribed fire, cutting tools and equipment operation, herbicides, and other techniques. Proper protective clothing will be worn by employees as prescribed in use manuals for methods such as chemicals and fire (BLM Manual H-1112-1).

The project design of prescribed fire will include consideration of such measures as smoke management, reduction, avoidance, and scheduling to protect recreationists and rural residents from smoke exposure (see Appendix B).

Information packets containing data on the potential hazards of chemical treatment methods will be made available to employees, the public, and contractors (see Appendix B and Herbicide Profiles, Appendix C). As new data becomes available, the information packets will be supplemented.

Worker Protection, Public and Occupational Accident/Incident and Illness Reporting

All workers who use or are exposed to hazardous tools/equipment including herbicide applications will utilize protective clothing and equipment that meet the specifications of the BLM Safety Manual, labels approved by the Environmental Protection Agency (EPA), and/or BLM risk analysis. (See worker protection in BLM Manual 9022; Manual Handbooks 1112-1, Chapters 14-16; and H-9011-1.)

A Job Hazard Analysis will be used for monitoring the impacts on human health. In addition an incidents-accidents system will be used for reporting employee, contractor, volunteer and public. In addition to injuries and illnesses, the system will be used to report vehicle accidents, property damage and fire losses (485 DM, Chapter 7 and BLM H-1112-1). Forms CA-1 and/or CA-2 for occupational exposure or injury and DI-134 for all reported accidents, incidents, and illnesses will be used.

The Report of Accident/ Incident (DI-134) will be used additionally to report health effects associated with vegetation management projects for forwarding to the Program Coordinator to be entered the Safety Management Information System (SMIS), reported to OSHA and used internally for trend analyses. The Federal Record System retains records for any employees exposed to toxic substances or harmful physical agents for 30 years (29 CFR Ch XVII 1910.20). Contractors will be required by stipulation to complete a DI-134 for each employee. The DI-134 along with the Project Accomplishment Report (herbicide use report) will list date of project work, specific assignments, herbicide formulation (if any) and ingredients used, safety or health hazards, and any health complaints.

Public Involvement

Determine the need or level of public involvement by reviewing the type of management actions. BLM management actions are divided into five categories (Manual 1790-1):

- Exempt from NEPA. Includes Congressional, emergency and rejected proposals.
- Categorical exclusions. Specifically identified actions, not restricted by exceptions list, that do not require an environmental assessment (EA).
- Actions already covered by an existing FONSI and EA, or EIS. Timber sales and multi-year EA. (Noxious weed control is in a separate EIS.)
- Actions covered by an EIS and require an EA.
- Actions that require an environmental impact statement.

Public involvement is to be encouraged and facilitated in vegetation management environmental analyses. The level and degree of public involvement will depend on public interest, type of analysis performed, and the method of treatment proposed.

The BLM will provide public notice whenever a site-specific project is considered to prevent or treat competing or unwanted vegetation with any proposed measure of treatment. (Excepted are actions exempt from NEPA or covered within a categorical exclusion.)

Public notice will precede the screening stage of the environmental analysis of the project under NEPA guidelines. Notification methods will include, at a minimum, a notice in local newspapers. Additional standard methods may include posting of public notices in the state office, district office and resource areas; and in other public rooms used to distribute public information concerning proposed Bureau actions. Notification lists maintained by the program

coordinators will be used in notifying the interested public of any proposed use of herbicides.

In case of an action with effects primarily of local concern, the notice may include: areawide clearing-houses, notices to potentially interested community organizations, direct mailing to owners and occupants of affected property, and posting of notice on and off site in the area where the action is located. The level of controversy will determine the need for notices and posting. Herbicide use areas will be posted. Notices must indicate procedures for interested persons to get information or status reports.

The public will be notified of the availability of the EA and FONSI (Finding of No Significant Impacts additional to those not already analyzed in a program's EIS). The manager responsible for authorizing the action determines the appropriate means of public notification and ensures its availability based on the extent of concern and interest in the action. All individuals or organizations that have requested notification on a specific action should be notified by mail where feasible. When considering the use of herbicides of special consideration the potential use will be made known to the public at the earliest practical time.

Before a decision is made to proceed with controversial treatment methods such as herbicides, the public will be invited to review and comment on the site-specific analysis of the project. When a decision is made for a site-specific project the public will be promptly notified of the final decision whether it is to proceed, or not to proceed.

Environmental analysis and public involvement will normally occur as indicated in four levels of project screening:

1. Screen unit for need of action, and set priorities. Where: Reforestation of timber sales or wildfire areas. Actions where no herbicides are proposed for use and the proposed treatment qualifies for categorical exclusions. Examples of current categorical exclusions:
   - Precommercial thinning
   - Manual maintenance and release.
   - Paper mulching and spot scalping.

2. Screen for need and complete environmental analysis. (Outside exclusions or controversial.)
   - Mechanical site preparation

3. Screen for need, complete environmental analysis, inform downstream water users.
   - Biological and grazing methods.

4. Screen for need, complete environmental analysis, inform downstream water users, notify adjacent property owners, provide public notification when there is a probable public exposure, and request response from those individuals who are hypersensitive. This screening should be done when proposing projects for herbicides and prescribed fire to determine appropriate risk management measures.

Considerations for public involvement when proposing vegetative management, regardless of type of treatment, is summarized on Table 5-2.

Project Design Features

Review site-specific conditions to determine which of the following project design features are needed.

Notify Private Landowners and Downstream Water Users

Residents and adjacent landowners within 0.5-mile of proposed treatment sites who likely could be directly affected by chemical drift, smoke, food or water contamination, or an accidental spill will be notified prior to any chemical, broadcast burning, or biological application, and actions will be taken to minimize any potential effects.

Minimum Width Buffer Strips

District guidelines as well as State water quality standards will be met by using buffer strips, contractual stipulations on method and techniques, and other site-specific criteria. Concerns to consider in planning and selecting a vegetative management strategy, treatment, or technique and in determining site-specific project design include stream bank stabilization, sediment rates, temperature, sensitive vegetation and other organisms, and bacteria counts. Buffer strips will meet resource management plan criteria and site-specific conditions.

When herbicides are used, the minimum buffer strips listed below will be reserved adjacent to class I and Important Class II (BLM order III and above) streams, lakes and ponds, pasture and agricultural lands. These minimum buffers will be in accordance with current interim protection requirements of the Oregon State Forest Practice Act requirements and definitions, or as specified on the herbicide use label.

Minimum Buffer Widths for Waterways When Herbicides are Proposed for Use

Application Technique	Minimum buffer Width
Manual wipe-on	High water mark
Manual	10 feet
Vehicle	50 feet
Aerial (Flowing stream)	100 feet
Aerial (Lakes and ponds)	200 feet

Applications of atrazine, a persistent chemical, in areas having shallow water tables or where aquifers are located in alluvial deposits along major streams, will be subject to guidelines for above-ground waterway buffers.

For mechanical and burning treatments, the minimum buffer along streams will be 25 feet.

Residences, Domestic Water Diversions and Agricultural Areas

Minimum buffer strips near residential, domestic water, and agricultural areas is determined by the site-specific application technique.

For aerial application of herbicides in areas adjacent to residences, a minimum buffer strip measuring at least 600 feet wide will not be treated unless a written waiver is provided by the landowner. For domestic water diversions in a drainage where aerial herbicide application is used, the minimum buffer will be 200 feet. Additional risk (exposure) assessment may be required for aerial herbicide treatment within 600 feet of a residence.

Aerial application of herbicides of special consideration (e.g., 2,4-D, asulam and atrazine) will be prohibited within 0.25-mile (1,380 feet) of residences.

For ground applications of herbicides, the minimum untreated buffer reserved between treatment areas and residences will be 100 feet.

Local conditions may require an expansion of the minimum widths. Some examples of site-specific factors that may necessitate additional buffer width include mode of transport (direct application, drift, and water flow), adjacent topography, buffer vegetation structure and functions, and nearby agricultural areas or gardens.

Other Sensitive Conditions

Buffer strips may also be recommended for wildlife habitat, scenic corridors, and other concerns as identified in land use plans.

Monitoring and Evaluation

Monitoring of the western Oregon vegetation management program will be done in accordance with established BLM procedures as provided for in BLM Manual H-1734-1, land use plans, and as indicated below. The need and type of monitoring will be dictated by the nature of critical components in the site-specific treatment area.

General guidelines for monitoring are as follows:

- Monitoring is to be done annually at both the program-wide and site-specific basis, and for worker and human health concerns. The Program Coordinators will: (1) project three-year estimates of proposed methods and techniques, (2) describe whether management actions are making satisfactory progress toward meeting objectives to reduce reliance on herbicides and meet prescribed fire air quality goals, and (3) present criteria for meeting goals.
- Site-specific post-treatment monitoring will be conducted to aid future planning, and at a minimum will include:

  -Efficacy of treatment or no treatment.
  -Costs, both direct and indirect.
  -Analysis of mitigating measures, unintended effects, and accidents.
  -Estimate of degree of success.
  -Assessment of both short and long-term effects on vegetation.
- Water Quality monitoring will be conducted per goals in land use plans to meet or exceed Best Management Practices guidelines. Monitoring of the spray operation will be conducted to determine if mitigating measures are being observed, are effective in maintaining water quality, and are in compliance with state water quality standards and herbicide label requirements. The potential for contamination of aquifers used by fish, or for municipal water or irrigation, will be considered in site-specific environmental assessments.

- The program-wide assessment will consider:

  -How well strategy is meeting management objectives (site preparation, seedling survival, improving wildlife habitat, roadside maintenance). Include "no action" locations in comparisons.

  -Whether assumptions are correct and potential impacts are as expected.

  -Effectiveness of mitigating measures.

  -Impacts on other resources (i.e., wildlife, water, air).

  -How projected need for herbicide and prescribed fire treatments can be reduced.

  -Consistency with federal agencies, state and local governments.

  -New data that would require alteration of program.

- Recording and reporting human health concerns would be done to verify job hazard analysis and risk assessments and would include review of:
  -Exposure incidence.
  -Accidents.
  -Worker health complaints.
  -Recording of treatment methods, including for herbicides: the exact identity, formulation, manufacture, mixture and method of application.
  -BLM Herbicide (Pesticide) Application Record, and worker and public Reports of Accidents/Incidents or Illnesses (DI-134, CA1 or CA2) for vegetative management projects.
  -Names of personnel working on herbicide projects, their assignments and dates of actual work (29 CFR XVII, 1910.20)

- The Program Coordinator will be incorporate any new data that would require alteration of the program.

- Conduct young stand monitoring during standard stocking survey at intervals of one, three, and five years and record treatment effectiveness, or as a post treatment evaluation survey on a sampling basis to be filed with BLM Project Implementation (Herbicide Application) Records.

- Submit annual report to Oregon State and Washington Offices for herbicide usage describing the acreage, amount, usage, location, and use strength for each chemical used. Retain project records for three years.

The above monitoring, along with planning and providing "no action" units or portions of units will help to determine effectiveness and need for action as a baseline comparison. Through these actions, the BLM will be able to determine if the actions are giving the desired management results.

Appendix 1-D
Scoping

Scoping of the Klamath Falls Resource Management Plan/Environmental Impact Statement (RMP/EIS) began in September 1986, when a mailer was sent to a mailing list of some approximately 2,100 parties, inviting them to identify issues and concerns for BLM to consider in the planning process. At that time the lands now managed by the Klamath Falls Resource Area (KFRA) west of U.S. Highway 97 in Klamath County were managed by the Medford District. Ten open houses were held by the Medford District BLM during the comment period, to help interested parties focus on the questions.

In September 1987 the boundary between the Lakeview and Medford Districts was moved to the Jackson/Klamath County line and the KFRA assumed management of BLM lands west of U.S. Highway 97 in Klamath County.

In 1989 the decision was made to broaden the scope of the RMP to include all of the lands managed by the KFRA. At that time the responsibility for the RMP/EIS was transferred from the Medford District office to the Klamath Falls Resource Area. In May of that year a mailer was sent to a list of approximately 550 people to identify any additional issues or concerns associated with the management of all the lands within the resource area. The KFRA held two open houses to help interested parties focus on their concerns.

Once the comments were received, the resource area's planning team and managers distilled a list of issues and concerns. The BLM distinguished an issue as a matter of controversy or dispute over resource management activities or land uses that are well defined or topically discrete and could be addressed in the formulation of the planning alternatives. In practice, issues are resolved by resource allocations, and do not lend themselves to formulating land use alternatives. Concerns are usually addressed by analysis and documentation in the RMP/EIS. Some of the concerns identified are not addressed by this RMP/EIS as they are beyond the control of the BLM state director, are unrelated administrative problems, or are not within the legal jurisdiction of the BLM.

The issues and concerns identified are described in chapter 1. This list of issues and concerns was sent to interested parties in March of 1987 and again in May of 1989.

Further scoping after that related to refinement of the issues, and determination of a reasonable range of alternatives to address in the RMP/EIS. The latter facet of scoping was handled through the development of a state director guidance for the formulation of the alternatives. The development of the state director guidance for the RMP process is discussed in appendix 1-E. This guidance also proposed a number of sensitivity analyses for the primary alternatives to address relevant management options that could not be effectively addressed in a manageable array of fully analyzed alternatives.

In public comments and internal discussions, there were a number of alternatives, or potential elements of alternatives, considered but eliminated from detailed analysis. These are summarized in the following discussions:

- Alternatives that would meet specific timber production target levels (such as one identified in a regional supply analysis or one that would maintain the level in existing plans). Such alternatives could be explicitly designed only with an optimization model. Early in the planning process, the BLM chose not to invest the many millions of dollars that would have been necessary to adopt and use an optimization model in its western Oregon planning effort.
- Alternatives that would explicitly reflect the policies and programs of the Oregon and California (O&C) counties, and of the State. Until opportunities and tradeoffs are fully analyzed, such alternatives could not be formulated. At that point in the process, it was the BLM's intent to develop a preferred alternative consistent with those policies and programs to the extent that they are consistent with each with federal laws and regulations.
- An alternative based on the assumption that Federal Land Policy and Management Act (FLPMA), rather than the Oregon and California Act, would be the predominant statutory mandate for management of the O&C lands. None of the initial set of alternatives was based on specific real or assumed statutory mandate. The BLM believes that management under FLPMA falls within the range established by the initial set of alternatives.

- A *no planned timber harvest* alternative. The BLM considers such an alternative for all BLM-administered lands in western Oregon outside the reasonable range of alternatives. The counterpart of a no timber harvest alternative would be an alternative that would remove all merchantable timber during the life of the plan. Such a departure from sustained yield principles is also clearly outside the reasonable range of alternatives.

- Alternatives that would consider using neither intensive management practices nor the *allowable cut effect* in setting an allowable sale quantity. The effect of foregoing these can be identified from the sensitivity analysis of the preferred alternative.

- An alternative that would forego slash burning, and another that would forego the use of herbicides. These activities and the options to forego them were addresses in the BLM's EIS, *Western Oregon Program Management of Competing Vegetation*, 1989. This RMP/EIS is tiered to that EIS.

- An alternative that would use even-age management as the predominant silvicultural system. In many locations that prescription would fail to meet reforestation standards, a violation of the sustained yield mandate. Uneven-age management is considered for use in stands where it would be economically and environmentally feasible and reforestation standards could be met.

- An alternative that would exclude Site IV lands from timber harvest. Such an alternative would not address any important environmental or resource management objectives better than the options already being addressed.

- An alternative that would maximize timber production subject to the constraint of economic feasibility. Analysis of the economic feasibility of alternative A showed that such a constraint would negligibly affect the ASQ of that alternative.

- Alternatives that would vary the size of spotted owl habitat protected for each nest site. In light of the Interagency Scientific Committee report and subsequent proposals by the U.S. Fish and Wildlife Service, the BLM concluded that such variation had little relevance.

- An alternative that would protect 110 spotted owl areas, as provided for in the 1987 revised BLM-ODFW agreement, was originally proposed by BLM. After the Interagency Scientific Committee report was released in 1990, this alternative no longer seemed relevant.

- An alternative that would manage all lands inventoried at VRM Classes III and IV as VRM Class II. Such an alternative would only be logical if matched with the other goals of an alternative and with a very constrained timber harvest base. This management option, intended to optimize protection of scenic values even on areas identified as low in scenic value, was felt to be too arbitrary to warrant its application as an additional constraint to alternatives that severely restrict timber production to emphasize more meaningful objectives.

- An alternative that would protect a minimum of 1/4-mile wide riparian management areas (RMAs) along third order and higher streams, Class I streams, and other waters; and maintain and enhance water quality at the highest level of water quality required for municipal use. Such an alternative would exclude almost all commercial forest lands from timber management. Such extensive RMAs would be far in excess of what is needed to protect water quality and riparian values. Thus, it was considered outside the range of reasonable alternatives.

Appendix 1-E
State Director Guidance for the RMP Process

According to Bureau regulations for preparing RMPs, "the State Director shall provide quality control and supervisory review, including plan approval, for plans and related environmental impact statements and shall provide additional guidance, as necessary, for use by District and Area Managers." "Guidance" means "any type of written communications or instructions that transmits objectives, goals, constraints or any other direction that helps District and Area Managers and staff know now to prepare a specific resource management plan."

Early in the process of concurrently preparing this RMP and five other RMPs which together cover all BLM-administered lands in western Oregon, the BLM State Director decided to develop comprehensive procedural guidance as planning criteria to assure consistent treatment of a variety of issues and concerns in the six plans. The intent to do this was conveyed to known interested parties in a mailer sent out by each BLM district office with planning responsibility on March 27, 1987. Suggestions for content of that guidance were solicited in the mailer.

There was limited public response, but that response, along with internal BLM recommendations, led to formulation of a proposed set of topics for State Director guidance. A mailer describing those topics were sent to the public for comment on August 11, 1987. Using further but still limited public comments, BLM modified its list of topics slightly and drafted Proposed State Director Guidance, which was sent out for public review by interested parties on May 13, 1988.

Although less than a hundred individuals and groups responded, many of the comments received were thoughtful and constructive, and addressed the proposals in depth. BLM undertook a substantial revision of many sections of the proposed guidance. This revision was done on a staggered schedule, to distribute the workload and provide timely guidance to the districts for each step in the process.

The first element of the guidance completed was Guidance for the Preparation of the Analysis of the Management Situation (AMS). This document summarizes important information about existing resource conditions, uses and demands, as well as about management activities and natural relationships. It provides the baseline for subsequent steps in the planning process, such as the design of alternatives and analysis of environmental consequences. The AMS also provides most of the data to be summarized in the "affected environment" chapter of the EIS. The AMS guidance prescribed minimum contents and table formats for the AMS for each plan. That guidance was essentially completed in October 1988, and slightly revised during 1989 and 1990.

A master glossary for the AMS was prepared as part of the State Director Guidance. It was completed in 1989, and later revised for inclusion in each Draft RMP.

The Guidance for Formulation of Alternatives was essentially completed in October 1990 but underwent modest revision during 1991 and 1992. A copy of the final version of this guidance is included in this appendix.

Two other sections, Guidance for Analytical Techniques Needed to Estimate Effects of Alternatives and Guidance for Use of the Completed Plan, were completed in July 1991, with slight modification of the former in 1992. Descriptions of complex analytical techniques have been appendicized to discussions of the relevant analyses in Chapters 3 and 4. The Use of the Completed Plan section was wrapped into the equivalent section of Chapter 2 of the Draft RMP/EIS.

The original draft guidance had two other sections that never became final. Guidance for the Executive Summary was dropped because the State Director's staff prepared that summary. Guidance for expressing consistency with plans, programs and policies of other agencies was never formalized, as BLM staff worked with state agencies and county planners until the Draft RMP/EISs were almost complete, on ways to express such consistency.

Guidance for Formulation of Alternatives

Introduction

The purpose of alternatives is to identify a range of reasonable combinations of resource uses and management practices that respond to planning issues and provide management direction for all resources. Five common alternatives will be addressed in each RMP, to provide a consistent set of distinct choices among potential management strategies.

A no change from the existing land use plan alternative will also be addressed. This is the "no action" alternative. In the other alternatives all existing land use decisions not found valid for continued implementation after 1990 (through an analysis summarized in the Analysis of the Management Situation), will be reconsidered.

Common alternatives that identify specific management actions along District boundaries will be consistent. Examples include elk management areas, spotted owl corridors or visual corridors.

This Guidance for Formulation of Alternatives may be modified later based on information identified in the districts' analyses of the management situation, or refinements that flow from the districts' site-specific development of common alternatives.

Goals and Objectives of the Common Alternatives

The purpose of the goal and objective statements for the five common alternatives (A through E) is to guide development of specific criteria. Each alternative, if implemented, is intended to achieve or meet its goal. Goal and objective statements focus on general direction of alternatives rather than technical points in issue-related criteria for the alternatives. In each alternative all resource management values would be accommodated to the extent consistent with the primary goals and objectives for that alternative.

Specific Guidance on Common Alternatives

The common alternatives would differ primarily in the way they allocate primary uses of lands (for example, lands allocated to intensive forest management, and lands allocated to protection of riparian zones).

The discussion on page 4 through part of pages 14 and 15 describes criteria for addressing each of the eleven planning issues in the formulation of the common alternatives. It also describes how land use allocations and management actions would vary in response to each issue. Within the specific constraints provided by the guidance for addressing each issue, the districts have flexibility to formulate the common alternatives as they consider appropriate to meet the goals and objectives of each alternative.

Klamath Falls Resource Area's Additions

The Klamath Falls Resource Area has both Oregon and California (O&C) grant lands west of Highway 97 (west side) and large blocks of public domain lands predominantly east of Highway 97 (east side); therefore, there are goals, objectives, and issues that are different from those for the other western Oregon BLM districts. This appendix describes those differences for each alternative, as well as adding two issues that are specific to the Klamath Falls Resource Area — range management and proposed hydroelectric or other alternative energy projects.

The goals and objectives for the five common alternatives have been supplemented to include the livestock grazing (forage) and proposed hydroelectric or other energy projects (other economically important values). This supplemental information is shown in bold print. In addition, references to anadromous fish have been changed to trout because there are no anadromous fish in the resource area.

The additions to the guidance for each issue (shown in bold print) address site-specific resource values that either do not exist or are not a concern for the rest of the western Oregon districts. This includes discussion of native plant communities (specific to the east side), Native American traditional use areas (specific to the resource area), forage utilization in riparian zones (specific to the east side); and the addition of two new issues — range management (mainly an east side issue, but it also affects lands on the west side of the resource area) and proposed hydroelectric or alternative energy projects (specific to the proposed hydroelectric project on the upper Klamath River and the four proposed pumped water storage projects in the resource area).

	Alternative A	Alternative B
GOALS:	Emphasize high production of timber, **forage,** and other economically important values on all lands to contribute to community stability.	**On lands west of Highway 97,** emphasize timber production **and other economically important values** to contribute to community stability consistent with the variety of other land uses such as fish and wildlife habitat, recreation, and scenic resources on O&C lands. Give equal consideration to all resource values on public domain lands. **On lands east of Highway 97, emphasize forage production and other economically important values to contribute to community stability consistent with the variety of other land uses such as fish and wildlife habitat, recreation, and scenic resources.**
OBJECTIVES:	• Produce the highest sustained yield of timber on all suitable forest lands legally available for harvest. • **Produce the highest sustained yield of livestock on all suitable rangelands legally available for grazing.** • Contribute to ecological functions important to timber **and forage** productivity and to habitat diversity to the extent possible consistent with the allocation for timber **and forage** production. • Manage threatened and endangered species habitat as legally required. • Provide Research Natural Areas (RNAs) and eligible Areas of Critical Environmental Concern (ACECs) to the extent consistent with the allocation for timber **and forage** production. • Manage appropriate Congressionally designated areas to maintain and enhance their scenic values. • Meet legal requirements for protection of wetlands and water quality, to protect **trout** habitat and other relevant values. • Emphasize substantial developed and dispersed motorized recreation uses. • Find no additional rivers suitable for designation under the Wild and Scenic Rivers Act. • Make land tenure adjustments which enhance BLM long-term sustained yield timber harvest **and forage** production opportunities. • Provide no special management in rural (residential) interface areas.	• Produce a high sustained yield of timber on O&C lands, and on public domain lands where nontimber uses and values are of lesser importance than timber production. • **On lands west of Highway 97, produce a sustained yield of livestock forage consistent with providing forage for wildlife and the Pokegama wild horse herd, and with other uses and values. On lands east of Highway 97, produce high sustained wield of livestock forage consistent with providing for wildlife, and other uses and values.** • Contribute to ecological functions important to timber **and forage** productivity and to habitat diversity using a system that maintains old growth, mature forest, **and other native plant communities** in large and small blocks. • Protect habitat of all threatened and endangered species and species with high potential for listing. Protect habitat of other species of substantial concern, **such as critical deer winter range,** to the extent consistent with high timber **and forage** production. • Retain existing RNAs and ACECs. Provide new RNAs and ACECs from eligible areas to the extent consistent with the emphasis on timber **and forage** production. • Manage scenic resources in selected areas of high recreation use. • Meet legal requirements for protection of wetlands and water quality and provide moderate additional protection for **trout** habitat, other substantial streams, and other water. • Provide for a wide range of developed and dispersed motorized recreation uses and opportunities, to minimize conflicts among recreation user groups. • Find eligible river segments suitable for designation as recreational, if they are important and manageable, and designation would not cause adverse economic impact. • **On lands west of Highway 97,** make land tenure adjustments which enhance BLM long-term sustained yield timber harvest opportunities on O&C lands, and which benefit a variety of uses and values on public domain lands. **On lands east of Highway 97, make land tenure adjustments which enhance long-term forage production opportunities consistent with a variety of other land uses.** • Adopt appropriate special forest/range management practices on BLM-administered lands intermingled with or adjacent to rural interface areas zoned for most dense residential occupancy.

Alternative C

Provide timber **and forage** production **and other economically important values** to contribute to community stability consistent with maintenance of biological diversity and the variety of other uses such as fish and wildlife habitat, recreation, and scenic resources on all lands.

- Produce a moderate sustained yield of timber.
- **Produce a a moderate sustained yield of forage for livestock, wildlife, and the Pokegama wild horse herd consistent with allocations for other uses and values.**
- Provide biological diversity using a system that maintains some old growth and mature forest, **and native plant ecosystems;** focusing on protection of areas where special status plant and animal species cluster.
- Protect habitat of all threatened and endangered species and species with high potential for listing. Protect habitat of other species of substantial concern through emphasis on biological diversity and to the extent consistent with moderate timber **and forage** production.
- Retain existing RNAs and ACECs. Provide new ones from eligible areas except where lands managed by others are considered to provide more appropriate opportunities.
- Manage scenic resources in selected high use areas, particularly emphasizing protection in corridors of existing and proposed wild and scenic rivers and major trails.
- Provide substantial protection **wetlands and riparian habitats, including trout habitat, along selected streams and other water environments.**
- Provide for a wide range of recreation opportunities emphasizing dispersed use, while reducing conflicts among recreational user groups.
- Find eligible river segments suitable for designation as scenic or recreational, if they are important and manageable, but not suitable for designation as scenic if designation would cause adverse economic impact.
- Make land tenure adjustments to benefit a variety of values and uses.
- Adopt appropriate special forest/**range** management practices in rural interface areas zoned for moderate or high density residential occupancy.

Alternative D

Emphasize protection and reestablishment of spotted owl habitat **and riparian ecosystem,** along with management and enhancement of other values such as dispersed non-motorized recreation opportunities and scenic resources, while sustaining some timber **and forage** production.

- Produce a sustained yield of timber consistent with allocations for other uses and values.
- **Produce a sustained yield of livestock forage while providing a high amount of forage to wildlife and the Pokegama wild horse herd.**
- Protect habitat of the spotted owl in accordance with the Owl Conservation Strategy.
- Protect habitat of all threatened and endangered species, species with high potential for listing, and species of related concern.
- Retain all existing RNAs and ACECs. Provide new ones from eligible areas except where lands managed by others are considered to provide more appropriate opportunities.
- Manage all identified scenic resources.
- Provide substantial protection for wetlands and riparian **zones through changes in timber management and livestock grazing and/or exclusion of animals from these areas** along most streams and other water **environments**.
- Emphasize dispersed nonmotorized recreation opportunities.
- Find eligible river segments suitable for designation as wild, scenic or recreational, if they are important and manageable.
- Make land tenure adjustments which would emphasize enhancement **of values and uses other than timber and forage.**
- Adopt special timber harvest, forest, **and range** management practices in rural interface areas zoned for moderate or high density residential occupancy.

Alternative E

Emphasize protection of older forests **and native plant communities;** and management and enhancement of values such as dispersed nonmotorized recreation opportunities and scenic resources.

- Produce a sustained yield of timber consistent with allocations for other uses and values.
- **Produce a sustained yield of livestock forage while providing the highest amount to wildlife and the Pokegama wild horse herd.**
- Protect all old growth and older mature forests **and other important native plant communities**.
- Protect habitat of all threatened and endangered species, species with high potential for listing and species of related concern.
- Retain all existing RNAs and ACECs and designate all eligible areas.
- Manage all identified scenic resources and provide some visual resource protection for all lands.
- Manage all riparian **zones** and wetlands to maintain and improve water quality and fisheries habitat, and contribute to wildlife habitat diversity **through protection of riparian native plant communities.**
- Emphasize dispersed nonmotorized outdoor recreation opportunities.
- Find all eligible river segments suitable for designation as wild, scenic or recreational rivers.
- Make land tenure adjustments which would emphasize enhancement of **values and uses other than timber and forage.**
- Adopt special timber harvest, forest, **and range** management practices extensively buffering rural interface areas zoned for moderate or high density residential occupancy and other rural interface areas as appropriate.

	All Common Alternatives	Alternative A
Issue No. 1: Timber Production Practices: Which forest lands should be available for timber management, and what practices should be used on those lands?	Guidance for All Common Alternatives: Lands allocated to intensive forest management under any of these alternatives would normally provide the highest nondeclining harvest level (even flow) of timber when the following conditions prevail: • Effective silvicultural techniques (such as clear cutting, shelterwood or partial cutting) appropriate to the land allocations are used. • All feasible site preparation and intensive management practices are applied. • Anticipated merchantability is the only constraint on minimum average stand diameter slated for future harvest. • Adequate budgets are available to support the resultant timber sale program and allied intensive management practices, as well as scheduled monitoring linked to those activities. The common alternatives assume these practices and conditions on the lands allocated to intensive timber management, but incorporate less intensive management practices on other available forest lands to the extent needed to be consistent with the allocation of those lands. Where consistent with the goals and objectives of each alternative, the following silvicultural and harvest practices would be implemented on lands allocated primarily to timber management, to meet multiple land use objectives: Minimize regeneration delay by reforesting harvested sites as soon as practical. Calculate an empirical regeneration period based on representative stocking survey results, expected timber sale contract lengths and management objectives. Reforest harvested lands with indigenous commercial tree species. Emphasis would be placed on utilization of genetically improved stock, **where available,** in accordance with the Western Oregon Tree Improvement plan. Use available site preparation and seedling protection practices, including herbicides, using an integrated vegetation management approach. Emphasize those techniques that have proved most effective in assuring seedling survival and growth. (Actual practices will be based on site-specific analysis following completion of the RMP.) Convert to conifers those lands classified as commercial forest lands presently occupied by grass, hardwoods and brush.	Allocate all forest lands for timber production consistent with the management direction for other resources (Issue Nos. 2 and 3, etc.) in this alternative, except the following: Nonsuitable Woodland (See Figure 1-E-1 for Chart showing TPCC categories.)

Alternative B	Alternative C	Alternative D	Alternative E
Allocate all forest lands for timber production consistent with the management direction for other resources in this alternative, except the following: Nonsuitable Woodland Suitable Woodland - Low Site	Allocate all forest lands for timber production consistent with the management direction for other resources, except the following: Nonsuitable Woodland Suitable Woodland - Low Site Suitable Woodland - Nonsuitable Commercial Forest Land	Allocate all forest lands for timber production consistent with the management direction for other resources, except the following: Nonsuitable Woodland Suitable Woodland - All Categories	Allocate all forest lands for timber production consistent with the management direction for other resources, except the following: Nonsuitable Woodland Suitable Woodland - All Categories The Fragile Gradient-Restricted component of the Fragile Suitable TPCC category Site Class V

	All Common Alternatives	Alternative A
Issue No. 1 (Continued)	Plant hardwood **and juniper woodland** sites for management of a sustained yield of **forest products,** where consistent with allocations for other uses or values. Implement commercial thinning of present and future stands where practical and where research indicates increased gains in timber production are likely. Practice initial spacing control of seedlings/saplings through planting or thinning in conjunction with the control of competing vegetation, to maximize wood production by concentrating site resources in individual tree growth. Plan nitrogen fertilization applications for all present and future stands where research indicates increased wood yields would result. Plant specific root disease centers with resistant tree species, **where appropriate**. Consider uneven-age management in stands where this method would be economically feasible and would maintain environmental values. Consider efficiency of field operations and assurance of prompt reforestation in selecting the size of timber harvest units. Apply proper soil management measures to maintain **or enhance** soil productivity.	
Issue Nos. 2 and 3: Old Growth Forests and Habitat Diversity To what extent and where should old growth and/or mature forest habitats be retained, maintained or reestablished to meet various resource objectives? To what extent and where should BLM manage habitat to support populations of native wildlife species?	Any wildlife habitat management practice (such as nest boxes, road closures and forage seeding) not listed in the following could be implemented under any of the alternatives, as long as it is compatible with other management objectives. All special habitat features would be managed to protect their values. Mature and old growth forests would be retained where Congressional designation of areas requires it. Snags and/or wildlife trees (to be converted to snags) would be retained where they occur on lands not allocated to timber harvest, except where public safety is a concern, and if left standing as nonmerchantable material on available forest lands. Where it would contribute to meeting wildlife tree objectives, create snags in areas not allocated primarily to timber production. A habitat goal of timber sale contracts would be to leave all snags and **mature** nonmerchantable trees that can be left consistent with safety considerations.	Mature and old growth forests, **and other native communities** would be retained on most lands excluded from planned timber harvest by inclusion in the following allocations and TPCC categories: Nonsuitable Woodland Riparian Management Areas Existing high-use recreation sites T&E species recovery areas where timber harvest is prohibited Wilderness Areas

Alternative B	Alternative C	Alternative D	Alternative E
Contribute to habitat diversity using a system that protects mature and old growth forest, **and native plant communities** in large and small blocks. Mature and old growth components of the forest would be distributed in a corridor system by seed zone and elevation. In the corridor system large blocks of approximately 640 acres would be connected by a series of small, stepping stone blocks of approximately 80 acres, spaced at about one-mile intervals. Blocks would be limited to defined corridor areas. Public Domain lands **west of highway 97** and the following allocations and TPCC categories **resource area wide** would receive priority for placement into the system, to the extent that they fit; for instance, if they provide needed habitat and are suitably located to contribute to the system. Nonsuitable Woodland Suitable Woodland - Low Site Riparian Management Areas Recreation Sites T&E species recovery areas where timber harvest is prohibited Special Areas (Natural Areas, ACECs) Wilderness Areas	This alternative would provide for retention and improvement of biological diversity. Blocks of forest land at least 600 acres in size and, where relevant opportunities exist, at least 2500 acres in size (including cornering tracts) would be identified as old-growth restoration and retention areas, totalling 15 to 20 percent of BLM-adminstered forest land. Identification of these areas would focus on protection of older forest stands, connectivity between larger reserves and subregions, and protection of identified areas where special status plant and animal species cluster. The remaining BLM-administered forest lands, not excluded from timber harvest to address other issues, would be subject to intermediate harvests for density management where feasible, to maintain open canopy conditions and promote retention of mixed species, as well as accelerate development of old growth structure conditions and prepare the stands for regeneration harvest	This alternative would manage habitats on BLM-administered lands to provide for a number and distribution of spotted owls that ensures continued existence of a well distributed population on those lands, so they may interact with spotted owls throughout the geographic range of the species, as recommended by the Conservation Strategy for the Northern Spotted Owl. Suitable wildlife trees would be retained to contribute to the maintenance or attainment of cavity-dweller populations on BLM-administered lands at 60 percent of the optimum woodpecker population level. Wildlife tree and down log management practices would be used on the available forest lands, including but not limited to retention of green culls, snags and down logs. All special habitat features would be appropriately buffered. **Protect native plant communities, which will provide habitat for diversity of native wildlife species.**	This alternative would preserve the following: - all existing forest stands over 150 years old. - additional lands within 400 feet of the above stands, to assist in maintaining natural ecological elements, protect the older stands from edge effect and natural disaster, and interconnect them into a sustainable network. - all suitable habitat forest stands which most closely match the lands within two miles of each spotted owl site occupied by a single or pair of owls in the last six years (1985-1990). In addition protect younger forest where needed to provide contiguous habitat within a mile of those sites. - in each section where BLM administers at least half of the land, a 40-acre block of the oldest stands remaining, concentrated around headwaters streams, to provide habitat for amphibians and nesting for pileated woodpeckers.

	All Common Alternatives	Alternative A
Issue Nos. 2 and 3 (Continued)		
Issue No. 4: Threatened and Endangered (and Other Special Status) Species Habitat What should BLM do to manage Federally listed threatened or endangered plants and animals and to prevent future Federal listing of plants and animals as threatened or endangered species?	Protect, monitor and manage habitats of Federal listed and proposed species in accordance with the Endangered Species Act and recovery plans, as legally required for self-sustaining survival.	Timber production constraints would be assumed in the formulation of the alternative only if critical habitat has been designated or there is a recovery or conservation plan within a month after completion of the Analysis of the Management Situation. Manage for the conservation of, and mitigate actions to protect habitats of, Federal Candidate, State Listed and Bureau Sensitive species where such actions would not diminish commercial use such as timber production.
Issue No. 5: Special Areas What areas on BLM-administered lands need special management to prevent irreparable damage to important historic, cultural or scenic values; **to protect Native American traditional use areas;** to protect botanical or fish and wildlife resources or other natural systems or processes; and to protect life and safety from natural hazards? Which of these areas should be formally designated as ACECs?	Any areas considered appropriate for Research Natural Area (RNA) designation would also be considered appropriate for ACEC designation.	Designate potential ACECs that meet criteria only if the relevant values are not protected by other authorities (e.g., Wild River designation, the Endangered Species Act). Existing ACECs and potential ACECs that meet the preceding standard, including RNAs and proposed RNAs, would be retained or designated on nonforest lands or nonsuitable woodlands of no substantial mineral potential. Other existing ACECs and RNAs would be revoked. **Protect other special areas which do not meet ACEC criteria (such as cultural resource sites, Native American traditional use areas, and native plant communities) to the minimum required by federal law.**

Alternative B	Alternative C	Alternative D	Alternative E
Suitable wildlife trees and/or snags would be retained to maintain, where possible, cavity-dweller populations at 40 percent of the optimum woodpecker population levels in new timber harvest units. Wildlife tree management practices would be used on the available forest lands, including retention only of mature green culls and snags. **Maintain a variety of existing native plant comminuties, which also provide habitat for a diversity of native wildlife species.**	Regeneration harvests on these lands would be either heavy partial cuts (green-tree retention) or group selection cuts, and would not occur until after a stand had established old growth characteristics. The lands in old growth restoration and retention areas, which have not attained old-growth characteristics, would be subject to similar density management, where feasible, until they attain such a condition. Suitable wildlife trees would be retained to contribute to the maintenance or attainment of cavity-dweller populations on BLM administered lands at 60 percent of the optimum woodpecker population level. Wildlife tree and down log management practices would be used on the available forest lands, including but not limited to retention of mature green culls, snags and down logs. All special habitat features would be appropriately buffered.		In addition to retention of wildlife trees on lands not allocated to timber management, suitable wildlife trees would be retained to contribute to the maintenance of cavity-nester populations at 60 percent of the maximum potential population level on lands allocated to timber management. Wildlife tree and down log management practices would be used on the available forest lands, including but not limited to retention of green culls, snags and down logs. All special habitats would be appropriately buffered. **Manage vegatation to protect or enhance a waide variety of native plant communities, which will provide habitat to the greatest variety of native wildlife species.**
Same as Alternative A, except protect habitats of Federal candidate, State listed and Bureau sensitive species to the full extent on public domain land, and protect habitats of Federal candidate (such as Category 1 and 2) species known only to occur on BLM-administered lands to the extent considered necessary to prevent their federal listing.	Same as Alternative B except for additional protection of special status species provided by criteria for Issues 2 and 3.	Manage all BLM-administered lands to support the conservation and protection of all Federal candidate, State listed, and Bureau sensitive species and their habitats.	Same as Alternative D.
Retain all existing ACECs and RNAs. Designate potential ACECs that meet criteria only if the relevant values are not protected by other authorities. Do not allocate new RNAs on available O&C land if a similar feature can be protected on a national forest. Designate all potential ACECs (including RNAs) on public domain lands, nonforest lands, nonsuitable woodlands, and other lands allocated to nontimber uses. **Manage other special areas which do not meet ACEC criteria (such as cultural resource sites, Native American traditional use areas, and native plant communities with an emphasis on timber or forage production unless protected by federal law.**	Retain all existing ACECs and RNAs. Designate potential ACECs that meet criteria only if the relevant values are not protected by other authorities. **Protect other special areas which do not meet ACEC criteria if they have a recognized value for recreational, scientific, Native American traditional use, or other uses.**	Retain all existing and designate all potential ACECs. **Actively identify and protect other special areas which do not meet ACEC criteria if they have recognized value for recreational, scientific, Native American traditional use, or other uses.**	**Designate all potential ACECs. Actively identify and protect other special areas which do not meet ACEC criteria. Protect or enhance other special areas for recreational, scientific, Native American traditional use, or other uses.**

	All Common Alternatives	Alternative A
Issue No. 6: Visual Resources Which, if any, areas of BLM lands should be managed to reduce visual impacts or enhance visual (scenic) quality?	Note: Guidance for Issue 11 (Rural Interface Area Management) also addresses and defines visual resource management for Alternatives B, C, D and E in rural interface areas, except where this Issue 6 guidance sets a higher standard of visual resource management. Guidance for Issue 9A (Wild and Scenic Rivers) establishes criteria that will substantially dictate visual resource management by alternative in proposed wild and scenic river corridors. See Issue 9A and Issue 11 guidance for details.	Provide VRM Class I management within existing boundaries designated by Congress for exclusive management. Manage all other available (for timber harvest) forest land under VRM Class IV management objectives. Manage other lands as inventoried.
Issue Nos. 7 and 8: Stream/Riparian/Water Quality Where and how should riparian zones be managed to protect and improve water quality, fisheries and wildlife habitat? What actions should be undertaken to comply with state water quality standards? What should BLM do to manage for special needs such as municipal and domestic use?	Guidance for All Common Alternatives: Establish Riparian Management Areas (RMAs) on perennial **and other important** streams (generally, 3rd order and larger streams), lakes, ponds and other waters, to meet Oregon Forest Practices Act requirements and Oregon water quality standards. Typical average widths of RMAs by alternative are displayed in Table 1-E-1. Within those RMAs no lands would be considered "available" (to offer timber for sale as part of the allowable sale quantity [ASQ]). Some timber harvest may occur, however, to achieve resource management objectives. These activities may include road construction and yarding corridors across streams and riparian zones to facilitate timber harvest outside the RMA. Logging, road building and site preparation methods would be designed to minimize the number and/or size of mass soil movements and to maintain the integrity of the RMAs. Other activities such as mining, recreation and OHV use would be regulated to protect water quality. Stream and riparian habitat improvement measures may be taken on any stream to improve water quality, fish habitat, and/or wildlife habitat. Activities would be designed to meet OFPA requirements and Oregon water Quality standards.. Protect wetlands in accordance with Executive Order 11988 and 11990. Comply with written agreements with public water systems serving municipalities.	**Manage forage utilization in riparian zones to meet minimum water quality standards and maximize forage production.**
Issue No. 9: Recreation Resources What areas or sites should be designed and/or managed to protect or enhance a variety of recreational opportunities?	Manage for dispersed recreation activities consistent with managed forest settings, including hunting, fishing, sightseeing, riding/hiking, and rafting. Maintain and manage existing recreation facilities which make available significant dispersed recreation opportunities, including recreation sites, boat ramps, trails, interpretive signs and related improvements. Manage existing Special Recreation Management Areas (SRMAs) and delineate Extensive Recreation Management Areas (ERMAs).	Manage existing high-use recreation sites and trails and expand them where needed. Close low use recreation sites and trails. Designate lands open to off-highway vehicles (OHV) and leave roads open to motorized use, except where such designation would conflict with other allocations.

Alternative B	Alternative C	Alternative D	Alternative E
Provide VRM Class I management within existing boundaries designated by Congress for exclusive management. Manage as inventoried all available forest land adjacent to, within one quarter mile, developed recreation sites, state and federal highways, state scenic waterways, and rivers designated under the Federal Wild and Scenic Rivers Act. Manage all other available forest land under VRM Class IV management objectives. Manage other lands as inventoried.	Same as Alternative B, except on available forest land where BLM-administered land makes up more than half of a viewshed, manage lands as inventoried.	Manage all lands as inventoried.	Same as Alternative D, except manage as VRM Class III all BLM-administered lands inventoried as Class IV; and manage as VRM Class I BLM-administered lands adjacent to, within one quarter mile, developed recreation sites, state and federal highways, state scenic waterways and rivers designated under the Federal Wild and Scenic Rivers Act.
Manage forage utilization in riparian zones to meet minimum water quality standards while maximizing forage production consistent with other uses and values.	**Establish set utilization levels within selected riparian habitats while producing a moderate sustained yield of forage.**	**Protect selected riparian ecosystems by excluding livestock from those areas. Manage all other riparian zones through the use of intensive grazing management, thereby enhancing other values.**	**Protect or enhance riparian zones to achieve a health and productive ecological condition for maximum long-term multiple-use benefits and values.**

Table 1-E-1. Riparian Management Areas

	Average RMA Width* (each side of the stream in feet)				
Stream Order	ALT. A	ALT. B	ALT. C	ALT. D	ALT. E
1					50
2				60	60
3	75	75	105	140	200
4	75	100	150	200	200
5	75	140	210	280	280
6	75	160	240	320	320
Lakes, Ponds & Other Waters	75	100	150	200	400

* Actual RMA widths would be determined by on-the-ground riparian vegetation, terrain and stream characteristics, but would be a minimum of 50 feet on all 3rd order and larger streams. First and second order streams would have RMAs designated if perennial or if the beneficial uses warrant.

Alternative B	Alternative C	Alternative D	Alternative E
Same as Alternative A, except support the State's Regional Economic Development Plan for the geographic area, retain options for new SRMAs and high value potential recreation sites and trails on public domain lands, maintain and/or improve all existing developed recreation sites, and consider reopening sites closed in recent years.	Allocate and manage new SRMAs. Continue management of all existing recreation sites and trails, and consider reopening sites closed in recent years. Emphasize wildlife viewing, interpretation and related old growth forest recreational opportunities, both to attract nonlocal visitors and to serve local users. Retain options for future development of high value potential sites, trails, and sightseeing opportunities. Impose additional OHV limitations or road closures to protect wildlife habitat or old growth forest recreational opportunities, minimize conflicts with hikers and horseback riders, or meet other resource objectives.	Same as Alternative C, except manage for an optimum range of nonmotorized recreation. Retain options for future development of recreation sites and facilities for dispersed recreational opportunities. Retain existing pockets of old growth forest that are both adjacent to and accessible from existing or potential recreation areas. Prohibit OHV and road use as appropriate to improve wildlife habitat or protect the ecosystem.	Same as Alternative D.

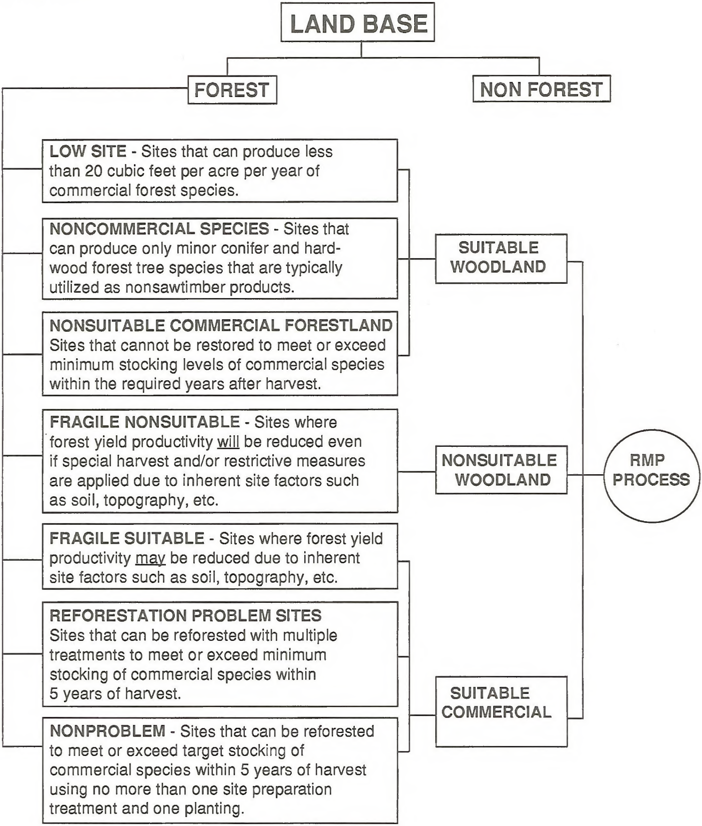
	All Common Alternatives	Alternative A
Issue No. 9A: Wild and Scenic Rivers What, if any, rivers should be found suitable for designation?	Provide interim protection for all river segments determined to be suitable, until Congressional action on BLM plan recommendations. Interim protection should be appropriate to the highest category for which the river is determined to be suitable. Manage Congressionally designated rivers consistent with their designation.	No rivers found suitable for designation under any classification.
Issue No. 10: Land Tenure In what areas would BLM-administered lands be sold, exchanged or transferred out of federal ownership under other authorities to improve management efficiency and benefit resource program objectives? In what areas would BLM attempt to acquire lands to improve management efficiency and benefit resource program objectives?	A major lands program effort would use exchanges to consolidate land ownership patterns to benefit one or more of the resources managed, such as timber, **range,** watershed, wildlife habitat, recreation, cultural, botanical, and minerals. Land tenure adjustment would be guided by a three-zone concept utilizing the following standards: Zone 1 includes areas currently identified as having high public resource values, and other efficiently managed lands. The natural resource values may require protection by federal law, Executive Order or policy. These lands may have other values or natural systems which merit long term public ownership. They do not meet the criteria for sale under FLPMA Section 203(a) and would generally be retained in public ownership. The Zone 1 boundaries should be relatively close to or on BLM property lines except where the intent is to show preferred acquisition areas. Zone 2 includes lands that are suitable for exchange because they form discontinuous ownership patterns, are less efficient to manage than Zone 1 lands, and may not be accessible to the general public. Where appropriate opportunities are identified, these BLM-administered lands may be exchanged for other lands in Zones 1 or 2, transferred to other public agencies, or given some form of cooperative management. These lands would not be expected to meet the criteria for sale under FLPMA Section 203(a), and would not be identified as suitable for such sale. Zone 3 includes lands that are scattered and isolated with no known unique natural resource values. Zone 3 lands are available for use in exchanges for private inholdings in Zone 1 (high priority) or Zone 2 (moderate priority). They are also potentially suitable for disposal through sale under FLPMA Section 203(a) if important recreation, widlife, watershed, threatened or endangered species habitat, and/or cultural values are not identified during disposal clearance reviews and no viable exchange proposals for them can be identified.	Exchanges would be made to acquire lands which would enhance the nondeclining harvest level of the commercial forest land managed by BLM, by improving age class distribution or other harvest level determination factors. **Exchanges would also be made to enhance long-term forage production.** Factors to consider include site quality, access to public forest land, logical logging units, and management of public forest land to facilitate timber harvest. No exchanges would be made to acquire lands more valuable for nontimber/ **nonforage** uses. No commercial timberland or rangeland would be sold or leased. Leases or conveyance of land in Zones 2 and 3 other than commercial timberland **or rangeland** would be made under the Recreation and Public Purposes Act to provide appropriate facilities or services.

Alternative B	Alternative C	Alternative D	Alternative E
No rivers found suitable for designation as wild or scenic. River segments eligible for wild, scenic or recreational classification found suitable for designation as recreational, if all of the following circumstances exist: - no net adverse economic impacts on the local economy. - river segment possesses at least one outstandingly remarkable value for which it is considered by BLM to be the top river in the State Comprehensive Outdoor Recreation Plan (SCORP) region. - BLM can effectively manage the outstanding values of the river segment.	River segments eligible for scenic or recreational river status found suitable for designation consistent with their highest potential classification, and river segments eligible for wild classification found suitable for designation as scenic, if all of the following circumstances exist. If only the economic impact test is not met, find suitable for designation as recreational. - no net adverse impacts on the local economy. - river segment possesses at least one outstandingly remarkable value for which it is considered by BLM to be among the top two rivers in the SCORP region. - BLM can effectively manage the outstanding values of the river segment.	Eligible river segments found suitable for designation consistent with their highest potential classification if the following circumstances exist. - river segment possesses at least one outstandingly remarkable value for which it is considered by BLM to be among the top four rivers in the SCORP region. - BLM can effectively manage the outstanding values of the river segment.	All eligible river segments found suitable for designation consistent with their highest potential classification.
Exchanges of O&C lands would be made primarily to acquire lands which would enhance timber management opportunities. Exchanges of public domain lands would be made to benefit one or more of the resources managed, including nontimber values. Sale of O&C lands other than available commercial forest lands, and of public domain lands, would be made to dispose of lands that meet any of the criteria of FLPMA Section 203(a). Leases on such lands would be made to accommodate other uses. Leases or conveyances under the Recreation and Public Purposes Act would be made in Zones 2 and 3 to provide appropriate facilities or services.	Same as Alternative B, except emphasis would also be given to exchanges of O&C lands that would contribute to conservation of biological diversity.	Land exchanges would be made to benefit one or more of the resources managed. Exchanges involving disposal of timber to acquire lands containing greater nontimber values would be emphasized. Sales of lands other than available commercial forest lands would be made to dispose of lands that meet criteria (1) or (2) of FLPMA Section 203(a), but sales of land that meet only criterion (3) would not be made. No lands would be leased, except leases and conveyances under the Recreation and Public Purposes Act would be made in Zones 2 and 3 to provide facilities or services for the benefit of the public.	Same as Alternative D.

	All Common Alternatives	Alternative A
Issue No 10. (Continued).	The discussion of Zone 3 lands must state which of the disposal criteria in FLPMA Section 203(a), apply. Zone 3 lands would also be available for transfer to another agency or to local governments, as needed to accommodate community expansion and other public purposes.	
Issue No. 11: Rural Interface Area Management Which BLM-administered lands should be allocated to receive special management practices due to the concerns of residents who live in close proximity? (Rural interface areas are areas where BLM-administered lands are adjacent to or intermingled with privately owned lands where county zoning has created or allows for creation of lots as small as 1 to 20 acres. In most rural interface areas concerns of the residents are related to forest and range management practices, visual quality and potential affects on domestic water sources and water supplies.)		No special management actions except those that address other issues.
Issue No. 12: Range Management What should the BLM's grazing management program be? Should the BLM maintain the existing management program, modify it, or provide more intensive management? How should available forage be allocated?	Where consistent with the goals and objective of each alternative, the following range management practices could be implemented on lands allocated to forage production to meet multiple-use objectives: - remove competing vegetative cover such as juniper, etc. through the use of mechanical methods, prescribed fire, or herbicides to increase forage production - develop waterspreaders to increase forage production - construct/develop a variety of range improvement projects - implement a variety of grazing systems.	Produce the highest sustained yield of livestock forage on all suitable rangelands.
Issue No. 13: Proposed Hydroelectric or Alternative Energy Projects What actions would the BLM take in response to proposed hydroelectric or alternative energy projects on BLM lands?		Issue rights-of-way for all proposed hydroelectric or alternative energy projects where they do not conflict with timber and forage production.

Alternative B	Alternative C	Alternative D	Alternative E
On BLM-administered lands within one quarter mile of private lands in identified rural interface areas zoned for 1 to 5-acre lots, customary forest/range management practices would be altered, where realistically feasible, to mitigate the adjacent neighbors' concerns (such as management would look for alternative methods of practicing intensive forest/range management). Examples of management options include harvest regimes other than clearcutting, hand application rather than aerial application of herbicides and pesticides, inclusion of additional buffers for domestic water sources, and hand piling slash for burning as opposed to broadcast burning. All BLM-administered lands within a quarter mile of designated rural interface areas 1 to 5-acre lots) would be managed for VRM class III objectives.	Same as Alternative B except that lands zoned for 1 to 20-acre lots would also be included as the rural interface area.	On BLM-administered lands within one quarter mile of private lands in rural interface areas zoned for 1 to 20-acre lots, there would be no herbicide spraying, no clear cutting, **and fuel hazards would be reduced with methods other than prescribed burning.** BLM-administered lands within this area would be managed for VRM class II objectives.	Same as Alternative D except BLM-administered lands within one half mile of private lands in rural interface areas would be managed as discussed in Alternative D. Areas zoned for lots larger than 20 acres, but with tax lots of 20 acres or less and/or existing legal multiple residences, may also be addressed in this alternative.
On lands west of Highway 97, produce a sustained yield of livestock forage consistent with providing forage for wildlife and the Pokegama wild horse herd, and with other uses and values. On lands east of Highway 97, produce a high sustained yield of livestock forage consistent with providing forage for wildlife, and with other uses and values.	**Produce a moderate sustained yield of forage for livestock, wildlife, and the Pokegama wild horse herd consistent with other uses and values.**	**Produce a sustained yield of livestock forage while providing a high amount of forage to wildlife and the Pokegama wild horse herd.**	**Produce a sustained yield of livestock forage while providing the highest amount to wildlife and the Pokegama wild horse herd.**
Issue rights-of-way for all proposed hydroelectric or alternative energy projects consistent with other land uses. On Public Domain lands west of Highway 97 give equal consideration to other resource values.	**Issue rights-of-way for all proposed hydroelectric or alternative energy projects consistent with the management direction for other resources.**	**Issue rights-of-way for all proposed hydroelectric or alternative energy projects consistent with the management direction for other resources.**	**Deny all rights-of-way for proposed hydroelectric or alternative energy projects that conflict with any other resource value.**

Figure 1-E-1


LAND BASE
FOREST
NON FOREST
LOW SITE - Sites that can produce less than 20 cubic feet per acre per year of commercial forest species.
NONCOMMERCIAL SPECIES - Sites that can produce only minor conifer and hardwood forest tree species that are typically utilized as nonsawtimber products.
NONSUITABLE COMMERCIAL FORESTLAND Sites that cannot be restored to meet or exceed minimum stocking levels of commercial species within the required years after harvest.
FRAGILE NONSUITABLE - Sites where forest yield productivity will be reduced even if special harvest and/or restrictive measures are applied due to inherent site factors such as soil, topography, etc.
FRAGILE SUITABLE - Sites where forest yield productivity may be reduced due to inherent site factors such as soil, topography, etc.
REFORESTATION PROBLEM SITES Sites that can be reforested with multiple treatments to meet or exceed minimum stocking of commercial species within 5 years of harvest.
NONPROBLEM - Sites that can be reforested to meet or exceed target stocking of commercial species within 5 years of harvest using no more than one site preparation treatment and one planting.
SUITABLE WOODLAND
NONSUITABLE WOODLAND
SUITABLE COMMERCIAL
RMP PROCESS

Sensitivity Analyses

Sensitivity analysis is a process of examining specific trade-offs which would result from making changes in single sensitive elements of an alternative. Such analyses are helpful in developing the preferred alternative, to make it most effective in reconciling potential conflicts and optimizing overall benefits. The sensitivity analyses will have the further benefit of informing the public about certain trade-offs, which should facilitate their offering informed preferences in their comments on the Draft RMP/EIS.

Sensitivity Analyses of Land Use Allocations

This analysis will identify approximate opportunity costs associated with differing approaches to the most sensitive land-use allocations and decision elements.

Because of the number of land use allocation issues and alternatives, sensitivity analysis must be tightly focused to be manageable. The analysis, therefore, will focus on mid-range alternatives.

At a minimum, the following will be analyzed for effects on timber harvest (ASQ) and related jobs and county revenues, and on other relevant resources or values:

- For alternatives B and D, effects of substituting the next higher and next lower alternative levels of snag and wildlife tree protection and of providing no protection on land managed for timber production.

- For alternatives B, C, and D, effects of substituting the next higher and the next lower alternative levels of riparian zone protection, and of providing only legally required (alternative A) protection of riparian zones to preserve commercial trees on suitable forest or woodland.

- For alternative B, the effects of allocating no lands specifically for maintenance of older forest stands; or of managing the lands allocated for such protection on a 250-year or longer rotation, with explicit provision for replacement; or of managing the lands allocated for timber production on a 150-year rotation.

- For alternatives B and C, the effects of managing all lands allocated for timber production entirely under either of Alternative C's partial retention approaches.

- For alternative C, the effects of managing the lands allocated for timber production entirely for 15 to 20 percent partial retention, but in the first decades not harvesting in the oldest 20 percent of those lands.

- For alternatives B and D, the effects of substituting the USF&SW proposed spotted owl recovery plan for each alternative's older forest or spotted owl protection approach.

Sensitivity Analysis of Timber Management Prescriptions

In BLM's May 1988 Proposed State Director Guidance a number of sensitivity analyses of preferred alternative timber management prescriptions were proposed. At that time criteria for all common alternatives called for traditional approaches to timber management. The evolution of the common alternatives has changed that, so assumptions about the timber management prescriptions of the Preferred alternative are premature.

Until those prescriptions are identified, it is impossible to ascertain what sensitivity analyses of those prescriptions may be relevant. That question will be revisited by BLM as each district selects its Preferred alternative.

Chapter 2
Appendix

Appendix 2-A
Best Management Practices

Introduction

The BLM is obliged by a number of federal laws to consider water quality during the planning process. Foremost among these laws are the Federal Land Policy and Management Act of 1976, the National Environmental Policy Act of 1969, the Federal Water Pollution Control Act of 1956 (as subsequently amended by a number of other laws, including the Clean Water Act of 1977 and the Water Quality Act of 1987), the Oregon and California Lands Act, and Executive Order 12088 of 1978 which established the BLM's responsibility for coordinating pollution control efforts with the requirements of the above federal acts. Floodplains and wetlands are protected in accordance with Executive Orders 11988 and 11990. Cumulatively, these laws require the BLM to protect water quality during its land management planning and implementation and to comply with all state and local water quality protection measures.

Two new policies on water conservation and efficient use and protection of water resources on public riparian lands were adopted in December 1990 (OAR 690-410-060 and OAR 690-410-050, respectively). The new policy on conservation requires programs to eliminate waste, directs major water users and suppliers to prepare water management plans, directs suppliers to prepare water management plans, and promotes development of subbasin conservation plans in designated water problem areas. The policy for protection of water resources on public riparian lands requires that water-related functions in riparian zones on public lands be protected. On public lands, management activities in riparian zones "shall be planned to maintain or improve riparian conditions that support water-related functions, consistent with the constitutional or statutory purposes of the public land."

Section 319 of the Water Quality Act directs the states to prepare a statewide management plan that outlines a nonpoint source (NPS) pollution control program. Oregon's NPS management program includes two goals for NPS prevention and control efforts: the protection, in every waterbody, of water quality necessary for full support of the various designated beneficial uses of water and the maintenance of "high quality" waters wherever they are found (DEQ 1988a).

Oregon's NPS management plan requires the BLM to continue coordination with the Oregon Department of Environmental Quality (DEQ) for implementation of best management practices (BMPs) that protect the beneficial uses (see Glossary) of water. BMPs are those land and resource management techniques designed to maximize beneficial results and minimize detrimental results of management actions (DEQ 1988b). BMPs are also designed to meet the BLM's goals and objectives for soils and water resources, which are: to protect, maintain, or improve the quality of soil and water resources and watershed values associated with BLM lands, including natural site productivity, surface and groundwater quality, quantity and timing, and proper functioning condition of riparian-wetland areas; to prevent or minimize the threat to public health and safety, damage to natural site characteristics or economic losses due to floods, sedimentation, decreased water quality, or accelerated runoff or erosion; to provide treatable water at the point of intake for surface water used by public water systems serving municipalities; and to minimize the destruction, loss, or degradation of wetlands, including riparian areas.

Monitoring and evaluating the effectiveness of BMPs is required by Oregon's NPS management plan to ensure that water quality requirements are achieved and that beneficial uses are maintained. When monitoring identifies unanticipated impacts, the information would be used in subsequent development of mitigating measures, including BMPs, and considered in analyses of cumulative effects.

The Council on Environmental Quality (CEQ) regulations require that all federal agencies consider cumulative impacts in environmental analysis. Council on Environmental Quality regulation 40 CFR 1508.7 defines cumulative impact as the impact on the environment that results from the incremental impact of an action when added to other past, present, and reasonable foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. General requirements for cumulative effects analysis are identified in the National Environmental Policy Act (NEPA) regulations, 40 CFR 1508.25 (a)(2) and (c) and 1508.27 (b)(7). The Clean Water Act, section 208 (b)(2)(F), requires that cumulative effects be mitigated "to the extent feasible".

The cumulative effects of separate activities in a watershed can cause water quality damage and changes in the hydrology of a watershed (timing and amount of peak runoff). Also, long-term maintenance of water quality is linked to long-term maintenance of soil productivity. Cumulative watershed effects analysis assesses the potential of an action to cause nonpoint source pollution and assists in the prediction of effects that might be missed during project proposal level planning. Additional preventative measures or restorative actions could then be established in response to the results of the analysis. By recognizing that a watershed is a complex and dynamic system influenced by a variety of factors, a cumulative watershed effects analysis assures that hydrologic effects, erosion processes, and biologic responses are considered from the outset of the planning process (see appendix 3-B). Assessing the effects of management actions on non-federal lands is often difficult, due to the difficulty of obtaining complete or accurate information on these lands.

In Oregon, as elsewhere, water quality requirements are defined by the beneficial uses of water the state wishes to protect. Under the antidegradation policies of federal and state governments, the highest existing beneficial use of a water body must be protected. Any change in or near a natural stream is a disturbance, and disturbance, even small ones, can cause cumulative watershed effects that force a stream out of equilibrium. Timber harvest, livestock grazing, road building, and intensive recreation are examples of activities on BLM-administered lands that commonly cause stream and watershed disturbance. Cumulative effects can occur even if BMPs are implemented. Best Management Practices help reduce but do not always stop cumulative effects; therefore, cumulative watershed effects analysis is used to reduce the risk of adverse cumulative effects.

Direct, indirect, and cumulative effects on water for project level activities would be analyzed for appropriate sized watersheds. The analysis would determine whether implementation of standard BMPs are sufficient to comply with Oregon water quality requirements. Proposed activities that appear likely to result in violation of these criteria would be modified to mitigate the effects on water quality or deferred until it appears that such activities could be conducted in compliance with the requirements.

Management Direction For The No Action Alternative

(Lost River Management Framework Plan and Jackson-Klamath Management Framework Plan)

Lands West of Highway 97. Soil losses on actively eroding bare soil areas that reduce site productivity and/or degrade water quality would have the following treatments applied: in areas suitable for timber production, noncompetitive cover (grasses, legumes, shrubs) and commercial tree seedlings would be planted; on stream sides capable of producing timber, adapted shrubs and grasses, red alder, and commercial tree seedlings would be planted; in areas not capable of producing timber, native shrubs, grasses, and legumes would be planted; in areas that cannot be feasibly revegetated, but that are accessible to material application and equipment, visually compatible artificial soil would be used as covering; and areas that are inaccessable would be evaluated prior to any action.

The watershed practices handbook below outlines recommended watershed practices for each soil association. These practices would continue to be used when those management practices outlined in the No Action Timber section of chapter 2 are not applicable or do not provide enough protection for soils of a particular association. Otherwise, the management practices in the No Action Timber section would be recommended and used. Those soil associations occurring in the KFRA portion of the Jackson-Klamath sustained yield unit, as identified in the Jackson-Klamath management framework plan, and their associated recommended watershed practices, are outlined below.

Watershed Practices Handbook

Alluvial Land Association. Locate roads above the floodplain. Where it is necessary to construct roads within the floodplain, design the road to withstand inundation by rapidly flowing floodwaters. Place rock rip rap on both the upstream and downstream sides of the road. Elevate the road above anticipated floodwaters by using rock fill.

Skookum-McMullin Association; Heppsie-Carney-McMullin Association. End haul to a safe disposal site material that would otherwise be sidecast during

road construction. Shape and revegetate the disposal site. Locate roads on well drained soil types. Avoid wet areas by rolling the road grade. Place a perforated pipe or an open drainage ditch to intercept and divert surface and subsurface water upslope from the cutbank when crossing wet areas. Employ these practices only when alternate routes are not available. Ramp over wet areas using large rocks as a base where cuts are not required.

Medco-McNeil-McMullin Association; Medco Moist-McNeil Association; Tatouche-Bybee Association. Use low pressure ground skidders when the soil moisture content is less than 25 percent. Rip skid trails and landings following final harvests and during the driest time of the year. Prohibit blades during yarding. Confine skidder yarding to slopes less than 35 percent. Plant or seed skid roads prior to fall rains. Designate skid trails prior to timber harvest. Evaluate bug-killed timber thoroughly to determine cause of insect infestation before removing dead and dying trees. Disturbances caused by tractor logging and road construction may increase infestations which reduces mechanical support through root rot, thereby promoting massive failures. Remove dead and dying timber by methods that minimize surface disturbance. Prohibit tractor logging in boggy areas or landscapes where water accumulates. Locate skid trails on ridges or other convex positions. Partial cut timber and avoid cutting brush or hardwoods on slopes exceeding 70 percent. Use suspension cable or aerial harvesting systems. Directionally fall trees to the lead. Limb all trees before yarding. Avoid tractor logging where shallow soils occur. Use alternatives to burning, such as herbicides, in site preparation. If herbicides are not effective, hand pile and burn or broadcast burn. Locate roads on stable positions. Avoid seeps, old landslides, and slopes in excess of 70 percent. End haul road construction materials to a safe disposal site that would otherwise be sidecast during excavation. Shape and revegetate the disposal site. Locate roads on well drained soil types. Avoid wet areas by rolling the road grade. Place a perforated pipe or an open drainage ditch to intercept and divert surface and subsurface water upslope from the road cutbanks, where crossing wet areas. Employ these practices only when alternate routes are not available. Ramp over wet areas using large rocks as a base where cuts are not required. Construct roads during that period of the year when the soil moisture content is lowest. Confine roads to slopes less than 70 percent. Roll the grade to take advantage of stable positions. Avoid high, steeply sloping cuts in highly fractured bedrock. Locate and design roads to minimize heights of cuts.

Farva-Pinehurst Association. Tractor log during winter when the snow depth exceeds one foot. Use low pressure ground skidder or horses when moisture content is less than 25 percent. Designate skid trails prior to timber harvest. Confine ground lead systems to slopes less than 35 percent. Rip and waterbar skid tails and landings following final harvests and during the driest time of the year. Rip to a depth of 12 to 15 inches, with spacing equal to depth. Establish deep rooting native vegetation on bare soil areas and cuts and fills. Minimize heights of cuts and fills by rolling the grade and locating roads on ridges whenever possible. Place straw or jute matting on areas that cannot be vegetated within one year of road construction.

Oatman Association; Woodcock-Pokegema Association; Woodcock Warm-Pokegema Warm Association. Tractor log during winter when snow depth exceeds one foot. Use low pressure ground skidders or horses when moisture content is less than 25 percent. Designate skid trails prior to timber harvest. Confine ground lead systems to slopes less than 35 percent. Rip and waterbar skid trails and landings following final harvests and during the driest time of year. Rip to a depth of 12 to 15 inches, with spacing equal to depth. Establish deep rooting native vegetation on bare soil areas and cuts and fills. Minimize heights of cuts and fills by rolling the grade and locating roads on ridges whenever possible. Place straw or jute matting on areas that cannot be vegetated within one year of road construction.

Roads would be built to standards adequate to serve their anticipated use. The topography would be followed and ridge crests and stable benches taken advantage of to minimize cuts and fills.

All unsurfaced or inadequately surfaced roads would be surfaced,if the roads would be left open to use. Existing and future unsurfaced spur roads subject to damage and erosion would either be surfaced or rehabilitated by outsloping, ripping, waterbarring, mulching, seeding, and/or fertilizing.

Road cut and fill slopes and landings would be mulched, seeded, and fertilized prior to the rainy season and would be refertilized at three to five year intervals on sterile or dry sites. Adapted, deep rooting, native shrubs would be planted on fill slopes exceeding 70 percent.

BLM standard spacing requirements would be used for maximum spacings of cross drainages and for sizing of water-course crossing structures (BLM Manual 9113). Drainage structures would be placed in stream courses or other locations where the outlets would be protected by vegetation or other sediment barriers. Energy

dissipaters and downspouts would be installed on culvert outlets not adequately protected by natural materials.

Roads would be constructed during the dry season of the year (June through October) in areas where a potential for erosion and degradation of water quality exists, unless there would be adverse impacts to recreation, fisheries, or wildlife. In areas where erosion and water sedimentation are minimal, road construction would be allowed throughout the year, subject to other resource constraints.

Material that has slumped or raveled onto road surfaces would be hauled to a safe disposal site such as a ridge; crest; natural bench; or a stable, gently sloping area if damage would occur from side casting material. Raveled or slumped material would be left in place if the roadway is wide enough to accommodate traffic safely. Roads would be graded and shaped during early summer.

When constructing roads along streams, stream channels and riparian zones would not be encroached with the road or debris from the construction operation. An adequate vegetative buffer would be maintained between the road and the stream channel. Recommended BLM guidelines would be used for filter strip widths between roads and streams.

A minimum width (measured horizontally) unsprayed buffer strip would be maintained when applying any herbicide except Silvex adjacent to perennial streams:

- 100 feet for aerial applications
- 25 feet for vehicle applications
- 10 feet for hand applications

The buffer strip widths would be doubled when Silvex is applied.

To maintain an acceptable level of soils productivity the following practices would continue to be recommended and/or implemented: ripping of skid roads with a winged ripper to ameliorate up to 80 percent of a compacted area; designating skid roads prior to harvest to reduce the percentage of impacted land, with intervals between skid roads ranging from 100 to 200 feet (closer spacing is used on steep slopes); avoiding the placement of skid roads on the contour when slopes exceed 20 percent; limiting tractor yarding to the dry season of the year to reduce soil compaction and eliminate soil puddling; requiring one end or complete suspension of logs during cable yarding; tractor logging during winter when snow depth exceeds 30 inches; using a low pressure ground skidder or horses when moisture content is less than 25 percent on areas other than designated skid roads; confining ground yarding systems to slopes less than 35 percent; limbing all trees before yarding in order to minimize soil disturbance; achieving low intensity burns on sensitive soils by burning when the duff is moist; using alternatives to broadcast burning such as hand piling and burning and gross yarding; leaving large downed woody debris on-site; minimizing the percentage of the land base converted to roads and landings; avoiding the placement of landings adjacent to streams and in wet areas (seeps, springs, high water tables); and, when possible, locating landings on level ground (less than 8 percent slopes).

Lands East of Highway 97. Multiple-resource management practices would continue on 24,718 acres of public land to maintain or improve present soil surface factor (SSF). Minor adjustments would be made to meet the changing resource values and conditions. To achieve the desired plant community and SSF, some basic conditions for forage utilization would be applied: 50 percent or less allowable use on native vegetation and 60 percent or less on introduced species. Key species would normally be decreasers, but interim management goals may be set with increasers as the key species.

Controlled burns, chaining, and plowing would continue to be used on a limited basis as a management tool. The EA process would be used to assess the impact on a watershed. The low sagebrush/bluegrass-onespike oatgrass vegetative type would not receive these treatments.

Development of major BLM projects (roads, waterholes, reservoirs) would not occur within floodplain areas. Only the development of projects that would not be seriously damaged by occasional floods would be permitted in these areas.

In severe erosion-susceptible areas, a pad of suitable material, 4 to 12 inches deep (depending on soil type) would be required. Suitable sub-base material and depth would be determined by individual road design.

Because roads are a major contributor of sediment input to streams, roads not needed for current management or public use could be rehabilitated or temporarily closed. Use of unimproved roads during the winter or wet seasons can cause much damage to the roads, and consequently can cause erosion problems.

Trees would be limbed prior to skidding. Tree-length skidding may occur to reduce soil compaction. Tractor logging would be avoided on unstable, wet, or easily compacted soils and on slopes which exceed 35 percent unless operations could be conducted without causing deep soil disturbance or accelerated erosion.

Tractor logging would not occur when more than the surface four inches of the soil has a water content greater than 95 percent of the optimum moisture content for compaction, as determined by a Proctor test on that or similar soils. A Speedy moisture tester would be used. Established skid roads would be used, where present. The use of crawler tractors would be continued. Roads and skid roads, where possible, that would not be used in the future would be blocked. Slash would be left in place, except in concentration areas and adjacent to main roads, where slash would be lopped, scattered, piled, and burned. Winter logging would be permitted when soil damage or damage to roads would not occur.

Management Direction Common To All Alternatives

A Watershed Management Practices handbook would be developed for the Klamath Falls Resource Area. This handbook would contain guidelines more specific and all-encompassing than those included in this appendix. These guidelines would provide for the maintenance of water quality and soil productivity and would assist in the selection of project design features and best management practices for various management activities. Additional BMPs specific to road construction and maintenance activities would be included in this handbook. Existing BMPs could be modified or new BMPs developed to meet requirements of the DEQ nonpoint source management plan.

New roads and associated structures would be located, designed, and constructed to minimize stream crossings to reduce the risk of soil or other material entering streams or other waters (such as lakes or ponds). Excavation would be limited to the practical amount needed to meet appropriate road standards. On a case by case basis, exposed soil would be stabilized and revegetated. Logging, road building, mining, and slash disposal methods would be designed to minimize the number and/or size of mass soil movements. Newly constructed arterial and collector roads would be surfaced, have drainage structures installed, and be maintained routinely. Where appropriate to the anticipated intensity of use, other roads would be paved or rocked to minimize sedimentation. On a case-by-case basis, temporary or permanent roads and trails could be closed (to prevent casual use and erosion) or obliterated (to mitigate past impacts and to put the area back into vegetative production). Closures would be accomplished with barricades or blockages, while obliteration of roads and trails would occur through subsoiling, waterbarring, and seeding and/or planting. Spur roads built for temporary use would be rehabilitated when that use is completed.

Proposed timber sales would be inventoried for existing soil compaction and designed to mitigate or avoid reductions in productivity. On most units, a network of permanent, designated skid trails would be established. In timber sales on lands west of Highway 97, skid trails would be designed to affect less than 12 percent of the land. Existing skid trails would be used as much as possible. Sites where the 12 percent standard is exceeded would require treatment, such as ripping or seeding. On lands east of Highway 97, the cumulative effects of detrimental soil conditions would not exceed 20 percent of the total acreage within an activity area (the total area of ground, such as a timber sale unit or a slash treatment area including roads, skid trails, and landings impacted by the activity). Detrimental soil conditions include compaction, displacement, and creation of cover conditions that do not meet the minimum requirements. Sites where the 20 percent standard is exceeded would require treatment, such as ripping or seeding.

New skid trails would be constructed on slopes averaging less than 35 percent. Operation on both new and existing skid trails would minimize soil displacement and would occur when soil moisture content provides the most resistance to compaction. Existing skid trails not needed as part of the network of permanent, designated skid trails would be ripped or tilled when conditions permit.

To minimize soil erosion, adequate waterbars on roads, spurs, skid trails, yarding corridors, and fire lines would be constructed prior to fall rains. Where soils have been severely disturbed by management activities, seed, mulch, and fertilizer would be applied as necessary prior to fall rains. Where practicable, seeding would occur using seeds of native vegetation or grasses (if available), or with a seed mixture designed to provide wildlife forage.

Track-type tractor site preparation would generally meet the following minimal conditions: tractor operations would be restricted to dry conditions with less than 20 percent moisture content in the upper six inches of soil; the lowest ground pressure machine capable of meeting objectives would be used; construction of piles as small in diameter as possible would occur; piles would contain small material (3-8 inch diameter predominantly); piling concentrations of large logs and stumps would be avoided; piles would be burned when soil and duff moisture are high; displacement of duff layers and topsoil into piles or windrows would be avoided; only two machine passes (one round trip) over the same area would be made.

To mitigate soil compaction resulting from past and present forest management activities, ripping/tilling with a winged subsoiler would occur following these general

guidelines: rips would be spaced no more than 36 inches apart and from 12 to 18 inches deep or to bedrock, whichever is shallower; soil moisture content would be less than 20 percent by weight as measured at a six inch depth; and subsoil mitigation would generally result in 80 percent of the compacted zone being fractured with 80 percent of the fractured soil material as clods of less than six inches in size.

When feasible, winter logging would occur when snow depth is 20 inches or greater.

Use of a mechanical harvester may require one of the following restrictions: six or more inches of frozen ground; 20 or more inches of hard snow (soft snow would require more depth); equipment would have three pounds per square inch of less ground pressure and would operate at 20 percent or less soil moisture at a six inch depth.

Management activities would be planned to retain small woody (dead and down) material to sustain soil nutrients and a healthy forest ecosystem. As a goal, ten tons or more per acre of nine-inch diameter or smaller woody material would maintained where practicable.

To stay within acceptable levels of soil loss and to meet soil management objectives, the following minimum requirements for percent effective ground cover after any soil disturbing activity would be followed (see table 2-A-1). Exceptions to these requirements may be made after completing the environmental assessment process with input from a watershed specialist. Effective ground cover is all living or dead herbaceous or woody materials and all rock fragments greater than 0.5 inch in diameter in contact with the ground surface. This includes trees, shrubs, seedlings, grasses, forbs, litter, and chips.

Salting areas for livestock would not be located within 1/4 mile of permanent water sources, adjacent to streams, or in riparian areas.

Only low intensity fire would be prescribed within 100 feet of class 1, 2, and 3 stream channels. No intentional ignition would occur within 50 feet of any streams or riparian areas except where watershed or riparian enhancement is the objective. Hand piling and burning would be the preferred fuel treatment method within 100 feet of class 1, 2, or 3 stream channels.

A minimum width (measured horizontally) unsprayed buffer strip would be maintained when applying any herbicide except Silvex adjacent to perennial streams:

- 100 feet for aerial applications
- 25 feet for vehicle applications
- 10 feet for hand applications

The buffer strip widths would be doubled when Silvex is applied.

The objective of emergency rehabilitation of watersheds following a wildfire would be to prevent and minimize erosion, minimize as practicable the loss of soil and on-site productivity, and the deterioration of water quality. Suppression activities include fireline construction, access road construction, firing operations, and aerial or ground application of fire retardants. Areas that have had their erosion potential significantly increased or their drainage pattern altered by suppression related activities would be stabilized where practicable. The use of heavy equipment in RMAs and on steep slopes would be limited or avoided when possible. Where fire trail entry into a RMA is essential, the approach would be at an angle rather than perpendicular to the RMA to avoid undue erosion. Water quality objectives would be weighed with the need for rapid suppression during the development of suppression activities. One of the objectives of the fire suppression program would be to rehabilitate suppression-related damage while avoiding causing damage that would be in excess of that which would be caused by the fire itself.

Table 2-A-1 Minimum Percent Effective Ground Cover

Surface Soil Erosion Potential	General Slope Percentage Range for Erosion Control	Minimum Percentage of Effective Ground Cover	
		First Year	Second Year
Low	0 - 20	20 - 30	30 - 40
Moderate	20 - 35	30 - 45	40 - 60
High	35 - 50	45 - 60	60 - 75
Severe	50 - 70	60 - 75	75 - 90

Off-road vehicle (ORV) use would be managed to minimize resource damage. Where ORV use is causing resource damage, use may be restricted or prohibited. Vehicles, including ORVs, would be prohibited in class 1, 2, or 3 stream channels, on sensitive stream banks, and, during wet soil conditions, in riparian zones and wetlands.

No timber harvest would be planned within a riparian management area (RMA) as part of the sustained yield timber management program. Riparian management areas would extend a minimum of 50 feet horizontal distance and an average distance that is wider, varying by alternative, on each side of perennial and other important streams (generally 3rd order and larger streams). Some tree cutting or other timber harvest activities, such as road construction, enhancement of fish and wildlife habitat, and yarding corridors to facilitate timber harvest outside the 50-foot zone, could occur in the RMA to achieve resource management objectives.

Brush, hardwoods, nonmerchantable and noncommercial vegetation, and selected commercial vegetation necessary to stream bank stability or water quality protection would not be cut or slashed in an additional 25-foot wide buffer strip, measured horizontally on each side of the minimum 50-foot buffer, and on all intermittent streams, whenever timber harvest activities, other than those associated with road construction, occur.

The following criteria would be followed in riparian management areas (RMAs):

- Yarding corridors through RMAs would be limited to the minimum number of feet feasible. The maximum width of any corridor would be 30 feet. Removal of logs through the corridors would require either full-log or one-end suspension.
- All timber felled adjacent to RMAs would be directionally felled away from the RMA.
- All snags in the RMA would be left, except where safety or fire hazard dictate removal.
- Where feasible, any trees felled within the RMA would be left in place unbucked and unlimbed, consistent with management for fish habitat.
- No skid trials would be placed in the riparian zone, except at designated crossings. All skid trails that enter riparian zones would be seeded (after use or prior to first rains, whichever comes first) to reduce erosion.
- No slashing, ripping, piling, site preparation, or other soil disturbing activities would occur in the RMA (except for designated skid trail crossings, roads, or yarding corridors).
- No more than 25 percent of the overstory canopy would be removed to facilitate yarding operations.

Unless otherwise authorized, drill site construction and access through RMAs would be limited to established roadways. New salable material sources should not be developed in and existing developments should not be expanded into RMAs. Reasonable access for the exploration and/or development of leasable minerals would be allowed in RMAs but would be highly controlled to protect riparian values. A no surface occupancy stipulation could be applied in an RMA if significant resource disturbance which cannot be mitigated would occur or if water quality requirements would be exceeded. Locatable mineral exploration and development in RMAs would be controlled as much as possible using surface management regulations.

All phases of a project, including road and drill site construction, maintenance, and rehabilitation, would be guided by the Clean Water Act. All hazardous substances, including fuels, would be controlled so as to prevent their accidental discharge into waterways. When mining would be in or near bodies of water or where sediment would be discharged, DEQ would be contacted. The operator would have the responsibility to obtain any needed suction dredging, stream bed alteration, or water discharge permits required by DEQ or other state agencies. Copies of such permits would be provided to the area manager if a notice or plan of operations if filed. Operations would meet DEQ criteria.

The following BMPs may be used to mitigate impacts resulting from disturbances associated with mining and minerals leasing activities, as appropriate:

- Prior to disturbance of slopes over 60 percent, an engineering or reclamation plan would have to be approved by the authorized officer (appropriate level BLM signing official). The plan would address the following: restoration of site productivity, adequate control of surface runoff; protection of off-site areas from accelerated erosion, such as rilling, gullying, piping, and mass wasting; surface-disturbing activities would not be conducted during extended wet periods; construction would not be allowed when soils are frozen.
- Staging areas for stream crossing equipment would be located outside of RMAs to reduce the possibility of sediment entering into streams and to reduce disturbance to vegetation in the RMA. A maximum

construction right-of-way of 30 feet would be used in RMAs. Variances to this would have to be approved by the authorized officer.

- All excavations would have all productive topsoil (usually the top 12 to 18 inches) first stripped, stockpiled, and protected from erosion for use in future reclamation. This would also include removal of topsoil before the establishment of mining waste dumps and tailings ponds if the waste material is to be left in place during reclamation. At all sites, removal and storage of subsoil and topsoil would be according to approved engineering designs submitted with the application for permit to drill. Care would be taken not to mix subsoil with topsoil. Erosion would be controlled on subsoil stockpiles through appropriate construction design with mulching and/or revegetation. Whenever possible topsoil would not be stored for extended periods (over two years) and would be used for immediate reclamation. Topsoil removed from the site would be protected to maintain its viability over the life of the project by applying it to the areas of disturbance outside the working area. These areas would be reseeded according to the reclamation plan. At abandonment, necessary topsoil would then be available from these areas.

- Existing roads and trails would be used as much as possible. Temporary roads would be constructed to a minimum width and with minimum cuts and fills. All roads would be constructed so as not to negatively impact slope stability. Existing or constructed roads would be used for vehicle travel; no off-road use of vehicles or equipment would be allowed without the approval of the authorized officer.

- Exploratory drill sites would be located next to or on existing roads when possible. All precautions necessary to stabilize structures would be taken during construction. Qualified supervision would be provided during the installation of all erosion control structures including the construction of berms, dikes, trenches, and the outslope fill. Land grading and clearing would be done only on the minimum area required for construction. Special design measures would be used, on a case-by-case basis, for new cut and fill slopes where moderate to high erosion hazards exist. Excavated material would be located away from perennial streams and important intermittent streams.

- All areas not needed for production on the well pads would be recontoured and rehabilitated following the drilling phase for each well. While in operation, and during periods of temporary shutdown, exposed ground surfaces susceptible to erosion would be protected by stabilization, seeding, mulching, installation of water diversions and routine watering of dust producing surfaces.

- Pit liners would be used to prevent groundwater contamination.

- Wells placed in freshwater aquifers would be cased and cemented to minimize migration of contaminants.

- Obliteration of well pads would include removal of drainage structures and associated fill dirt to the extent necessary to pass expected flood flows. Excavations in a disturbed site would be backfilled, and high walls reduced. An adequate seedbed would be prepared while recontouring. Compacted soils would be ripped or disked to a depth of at least six inches in rocky area and at least 12 inches in less rocky areas. The contour of the land would be followed to minimize erosion. All stockpiled settling pond fines, and then topsoil, would be spread evenly over the disturbed areas.

- After mining is completed, all new roads would be reclaimed, unless otherwise specified. High walls and cutbanks would be knocked down or backfilled to blend with the surrounding landscape. All culverts would be removed from drainage crossings and the fill cut back to the original channel. The roadbed would be ripped to a minimum depth of 12 inches to reduce compaction and provide a good seedbed. The road would be waterbarred, fertilized, seeded, and mulched if necessary.

- Tailings ponds would be allowed to dry out and the fines would be removed and spread with the topsoil, unless the fines contain toxic materials, which would be disposed of accordingly. The ponds would then be backfilled and reclaimed.

The following management actions could be used to mitigate water quality impacts in watersheds sensitive to management actions because of cumulative effects or other water quality concerns. Specific management actions would be selected as necessary to comply with the Clean Water Act and meet watershed objectives.

- A watershed/riparian enhancement plan would be developed and implemented that would encourage coordination with other landowners.

- The watershed would be deferred from management activities that would potentially degrade water quality. Deferment would occur for approximately five years, at which time the watershed would be reanalyzed.

- RMA widths would be increased to provide additional protection to streams and riparian zones.
- The use of restricted harvest practices, using biodiversity concepts, would be required.
- Helicopter logging would be required.
- Full suspension cable yarding would be required.
- Seasonal restrictions would be required, with no waivers for falling or yarding.
- Road caused impacts would be minimized by one or more of the following: reducing road densities, minimizing road widths and clearing limits; requiring end hauling; prohibiting new road construction; not allowing natural surface roads; requiring seasonal restrictions with no waivers for construction, renovation, and hauling; requiring special low impact maintenance and construction techniques; no roadside brushing/grubbing with an excavator; no blading and ditch pulling in the wet season; rocking ditch lines; pulling back sidecast from road construction and recontouring the roadway; pulling culverts and reshaping drainageway crossings.
- The watershed would be restricted or closed to ORV use.
- Regular compliance reviews on all activities in the watershed would be required.

Appendix 2-B
Water Resources

Introduction

This appendix contains descriptions of two BLM stream class systems. The current system was used in the Klamath Falls Resource Area (KFRA) during the life of the Jackson-Klamth management framework plan, but would be replaced by the proposed system.

Current Stream Class Systems

To be consistent with the Oregon Forest Practices Act (OFPA) of 1987 the following stream classification system was developed and employed in the KFRA:

Class 1. Class 1 streams provide habitat for salmon, steelhead, and/or large numbers of resident trout. In addition, any waters of the state that are used for domestic purposes (such as drinking, culinary, and other household human use) are to be treated as class 1 streams. This means that any class 3 stream (defined below) shall be treated as a class 1 stream if it falls in the domestic use category. At present, there are no streams recognized for domestic use within the KFRA.

Class 2. Class 2 streams provide habitat for small to moderate numbers of resident trout only.

Class 3. Class 3 perennial streams normally flow year-round, except during periods of extreme drought. They have well-defined channels and show signs of washing and scouring. The OFPA has designated streams that "have a significant summertime cooling influence on downstream OFPA **Class I** waters, and are at or near a temperature at which the production of anadromous or game fish is limited" as OFPA **Class II special protection** waters (**Class IISP** waters). Oregon Forest Practices Act **Class I** waters equate to the BLM's class 1 and 2 streams. Therefore, OFPA **Class IISP** waters are major BLM class 3 streams, which contribute significant summer flows to BLM class 1 or 2 streams. Oregon Forest Practices Act rules require operators to "leave 75 percent of the original shade along OFPA **Class IISP** waters" (OFPA 629-42-646, 2[e]). This will involve treating certain BLM class 3 streams more like BLM class 1 or 2 streams, in which commercial conifers may have to be reserved from cutting in order to meet shade requirements.

Class 4. Class 4 intermittent streams carry water most of the year, but cease to flow during the dry season because evaporation and percolation into stream bed and banks exceeds the available stream flow. They have well-defined channels. Channels showing active scouring or washing are included in this category even though they may flow only during or immediately after periods of precipitation or melting snow. Intermittent streams normally lack vegetative litter except during the fall, indicating stream flow sufficient to move material during runoff.

Class 5. Class 5 ephemeral streams carry only surface runoff and normally flow only during and immediately after periods of precipitation or melting snow. They form in slight depressions in the natural contour of the ground surface. Ephemeral streams do not normally develop sufficient flow to wash or scour their channels. Vegetative litter can usually be found in depressions.

Forest Management and Riparian Zones

Class 1 and 2 Streams. A horizontal 100 foot average width riparian management area (RMA) is in effect on each side of these types of streams. No harvesting is permitted in the RMA except to benefit wildlife, to salvage dead trees after a devastating fire, or to create yarding corridors across streams. Directional felling is used when harvesting within a tree length of these streams and RMAs to protect riparian habitat, streambank stability, and other vegetation. When yarding across streams, complete suspension is provided whenever practical. If complete suspension cannot be achieved, yarding corridors are designated. Mechanical site preparation, fertilization (aerial application), or prescribed burning are not allowed within 100 feet of all class 1 and 2 streams.

Class 3 Streams. All noncommercial conifers, nonmerchantable conifers, hardwood trees, and marked commercial conifers within 30 feet of class 3 streams are reserved from cutting. All trees designated for cutting within a tree length of class 3 streams are felled away from the streams. Piling within 30 feet of these streams, yarding up or down stream bottoms, scarification or ripping within 50 feet of class 3 stream channels, and the placement of skid roads and landings within 50 feet of streams are all prohibited. Tractor crossings are minimized and allowed only at approved

sites. Mechanical site preparation, fertilization (aerial application), or prescribed burning are not allowed within 30 feet of all class 3 streams.

Class 4 Streams. All noncommercial conifers, nonmerchantable conifers, hardwood trees, and marked commercial conifers within 20 feet of class 4 streams are reserved from cutting. All trees designated for cutting within a tree length of class 4 stream are felled away from the stream. Piling within 20 feet of streams; yarding up or down stream bottoms; scarification, piling, or ripping within 50 feet of class 4 stream channels; and placement of skid roads and landings within 50 feet of streams are all prohibited. Tractor crossings are minimized and allowed only at approved sites. Mechanical site preparation, fertilization (aerial application), or prescribed burning is not allowed within 20 feet of all class 4 streams.

Class 5 Streams. Landings are not allowed within 50 feet of class 5 channels. Tractor yarding up or down draw bottoms is also avoided.

Proposed Stream Class Systems

Class 1. Includes any perennial or intermittent streams that provide spawning, rearing, or migrating habitat for salmon, steelhead, and/or large numbers of resident trout or other specified fish species at any time of year. In addition, any waters of the state that are used for domestic purposes (such as drinking, culinary, and other household human use) would be treated as class 1 streams. This means that any stream would be treated as a class 1 stream if it falls in the domestic use category. At present, there are no streams known or recognized as usable for domestic use on or close to BLM lands within the KFRA.

Class 2. Includes any perennial or intermittent streams that provide spawning, rearing, or migrating habitat for small to moderate numbers of resident trout or other specified fish species.

Class 3. Includes perennial streams with no spawning, rearing, or migrating habitat for salmon, steelhead, or trout. These streams normally have visible surface water between July 15 and October 15, except during periods of extreme drought. They have well-defined channels and show signs of washing and scouring. The OFPA has designated those streams that "have a significant summertime cooling influence on downstream OFPA **Class I** waters, and are at or near a temperature at which the production of anadromous or game fish is limited" as OFPA **Class II special protection** waters (OFPA **Class IISP** waters). Oregon Forest Practices Act **Class I** waters equate to BLM class 1 and 2 streams. Oregon Forest Practices Act Class IISP waters are generally major BLM class 3 streams that contribute significant summer flows to BLM class 1 or 2 streams and would involve treating certain BLM class 3 streams more like BLM class 1 or 2 streams.

Class 4. Includes intermittent streams with no spawning, rearing, or migrating habitat for slamon, steelhead, or trout. Those streams have water most of the year, but generally cease to flow by mid-July because evaporation and percolation into stream bed and banks exceeds the available stream flow. They have well-defined channels. Channels showing active scouring or washing are included in this category even though they may flow only during or immediately after periods of precipitation or snow melt. Intermittent streams normally lack vegetative litter, except during autumn, indicating stream flow sufficient to move material during runoff.

Class 5. Includes ephemeral streams that carry only surface runoff and normally flow only during and immediately after periods of precipitation or snow melt. They form in slight depressions in the natural contour of the ground surface. Ephemeral streams do not normally develop sufficient flow to wash or scour their channels. Vegetative litter can usually be found in depressions.

Appendix 2-C
Timber Management

Introduction

This appendix consists of five major sections. Each section describes specific information regarding the planning, practices, or proposals for timber management in the Klamath Falls Resource Area (KFRA). The first section, Selection of Harvest Scheduling Model and Allowable Sale Quantity Calculation Process, describes the computer modeling systems used, why they were chosen, and procedures for determining the allowable sale quantity. In the second section, Silvicultural Systems and Practices Considered in the Common Alternatives, the different types of harvest systems and reasons for selecting particular harvest methods are explained. The third section, BLM's Genetic Selection Program and Genetic Diversity of Selected Species, describes the current efforts to improve management and species diversity through a genetic selection process. The fourth section, Description of Silvicultural Systems for the Preferred Alternative, gives the silvicultural and timber management prescriptions that would be used in implementing the Preferred alternative. The fifth section, Timber Harvest and Management Details, describes yield effects of intensive treatments, board foot/cubic foot ratios, and Preferred alternative harvest levels and assumed stand treatments.

Selection Of Harvest Scheduling Model And Allowable Sale Quantity Calculation Process

Selection Of Model

In 1986, early in the planning effort, the BLM began to explore the timber harvest scheduling model options available for their use. A timber harvest scheduling model combines timber production capability, operations inventory, and forest plot data for a given land base with proposed timber management prescriptions to determine potential annual timber harvest levels and their sustainability over the long term. By early 1987, TRIM-PLUS (Timber Resource Inventory Model - Plus Harvest Scheduling Enhanced), a binary search simulation model used for harvest scheduling and timber supply modeling, had been tentatively identified as most relevant to the BLM's needs. In the spring of 1987 public workshops were held on the model for interested parties. After considering the comments received that spring and summer, and testing the model on data from the late 1970s, the TRIM-PLUS model was selected.

The features of TRIM-PLUS that made it seem to be the optimum approach for the BLM's use were its ability to:

- make individual nondeclining harvest level calculations on multiple minimum harvest ages;
- handle various land use classes simultaneously;
- be used at the district level on enhanced personal computers;
- provide enhanced report generating and graphics capabilities;
- provide simplified input/output data (ease of use); and
- provide relatively inexpensive computer runs.

In 1991, the model was modified to permit simulation of multiple-canopy or uneven-age management prescriptions.

Although harvest scheduling models of various degrees of complexity were considered, the intent was to identify a relatively simple and reliable state-of-the-art system. The ability to interface the selected model with other specific resource analysis models/procedures, such as an elk habitat model, and to use the BLM's automated (mapped) resource database was desired. This interface process identifies different land use allocations in terms of acres and the model reflects resulting harvest level impacts in a trackable fashion. The TRIM-PLUS model also has the capability of optimizing investment levels.

ASQ Calculation Process

The allowable sale quantity (ASQ), an expression of the maximum nondeclining level of timber harvest sustainable over time, is estimated by TRIM-PLUS. The TRIM-PLUS model functions similarly to the SIMIX model used by the BLM in the 1970s and 1980s to generate ASQs. The ASQ volumes from TRIM-PLUS are given in merchantable cubic feet. Equivalent estimates in board feet are provided to help interpret the information.

The TRIM-PLUS model requires a variety of information to complete ASQ computations and harvest scheduling. The information needed falls into three basic categories: acres, volumes, and management assumptions.

West side acreage and volume information is derived from data stored in both the continuous forest inventory (extensive inventory) plots and the geographic information system (GIS). Management assumptions are inserted into the TRIM-PLUS model via yield tables for managed stands developed by the ORGANON growth and yield model (described later in this section of the appendix). In turn, ORGANON can be used in combination with System-1, which is a young stand regeneration and competition model developed by the California Research Association in cooperation with the U.S. Forest Service Southwest Experiment Station in Berkeley, California. Computer growth simulation for new plantations can be started in System-1, modeled with various levels of competition or at different densities, and then continued in ORGANON to final harvest. Checks were run to validate the performance of System-1 for southwestern Oregon plantations.

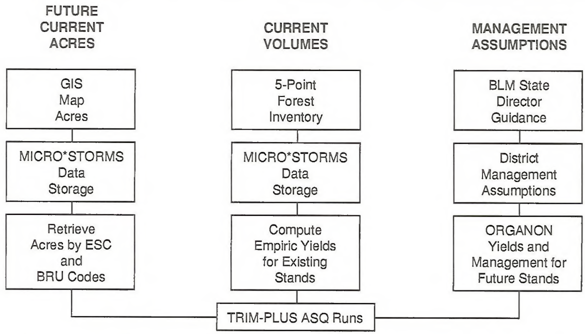
The following flowchart shows the principal components and sequence of events in preparation for making an ASQ run.

Current Acres

GIS map acres. Acres for the analysis of the management situation (AMS) were derived from digitized west side GIS map overlays. These are the GIS map acres referred to in the ASQ flowchart. There is a separate digital map for each topic or theme pertinent to the AMS. These maps can be overlaid or merged to allow analysis and generation of acres for a wide variety of situations.

MICRO*STORMS Database. The basic storage location for acres is a large relational database called MICRO*STORMS. Data is separated into three primary files: SITE, timber production capability classification (TPCC), and continuous forest inventory (CFI). Within each file, there is a separate record of information for each plot or unit of land, containing

ASQ FLOWCHART



Abbreviations used in this flowchart:
GIS = Geographical Information System
BLM = Bureau of Land Management
ESC = Existing Stand Condition
BRU = Basic Resource Unit
ASQ = Allowable Sale Quantity

many types of data. Selected information from these or other data files have been linked to the digitized west side geographical information system maps.

The SITE file contains 6,441 records and is comprised of data such as the basic resource unit (BRU) and existing stand condition (ESC) codes, acreage, timber type, site index, past and recommended treatments, timber volumes, stand age, and land use.

The TPCC file contains 2,800 records and is comprised of data relating to the timber production capability classification system.

The CFI file contains 305 records and is comprised of 5-point plot data for the west side and 10-point plot data for the east side. These data include general site descriptors, board foot and cubic volume, growth, basal area, trees per acre, average diameter at breast height, and tree heights.

Basic Resource Units. Within TRIM-PLUS, data is segregated by sustained yield unit, land status, forest type and site quality, existing stand condition, land use allocation, and prescription type. These groups of data are called basic resource units (BRUs). The ASQ and other output data from TRIM-PLUS is reported by BRU and for groups of BRUs, as well as for the entire sustained yield unit. The total number of BRUs established for the planning area varies between alternatives.

Existing Stand Conditions. Existing stand condition (ESC) codes are assigned to each BRU, and assist in grouping, sorting, and tracking similar kinds of stands. This sorting is accomplished by assigning the most appropriate ESC code from the following list to each MICRO*STORMS site file record.

Existing Stand Condition Codes

	Gross Forest Acres		
Code	West Side	East Side	Description
1, 16	3,605	123	Young stand meeting target stocking levels
2, 15	512	21	Young stand meeting minimum stock levels
3, 13, 14	77	25	Young stands which are understocked
4	292	1,086	Young stands, overstocked
6	2,317		Pre-commercial thinned (PCT) and fertilized
7	798	4,729	Pre-commercial thinned; not fertilized
10	1,015	1,147	Commercial thinned (CT)
11	419		Commercial thinned and fertilized
12	85		Planted, no survey
17	309		Fertilized, no PCT or CT
18	3,005		Stand at first merchantability (12 inch quadratic mean diameter)
30, 33	3,554	902	Past partial cut, non-stocked understory
31, 34	2,876	3,430	Past partial cut, understocked understory
32, 35	12,852	2,166	Past partial cut, stocked understory
38	3,627	255	Overstory removal completed
40	4,897	420	No past management
50	656		Potential conversion, brushfield
51	53		Potential conversion, hardwoods
53	235	1,205	Backlog
60	264		Sold, but not cut timber harvest unit
61	333	724	Cut, but not planted timber harvest unit
TOTAL	**41,781**	**16,233**	

Current Volumes

5-point forest inventory. Tree volumes on present stands are derived from 224 permanent inventory plots distributed throughout the Klamath Sustained Yield unit (SYU). Both conifers and hardwoods were cruised by certified BLM cruisers to the same standards used in timber sale preparation. Cubic foot volumes were computed from the inventory data using a BLM software program called UNIT1. Summary plot data is stored in the continuous forest inventory (CFI) MICRO*STORMS database file.

Empiric yields. In contrast to projected yields from *published stand tables* or computer models, *empiric yield tables* are constructed from sample plots of existing stands. Empiric yield tables are preferred over published yield tables whenever sufficient plot data is available to build such yield curves. Empiric yield curves were not developed for stands that were managed under multiple canopy systems, such as shelterwood retention or alternative C regimes. No empiric curves were developed for the Klamath SYU since all systems analyzed were multiple canopy systems. For multiple canopy regimes, all yield curves were developed using the ORGANON model.

Future Management Assumptions

Different silvicultural systems, and the practices contained in those systems, affect TRIM-PLUS outputs because they produce different quantities of yield in different periods. Intensive forest practices, such as thinning or fertilization, increase yields, but may or may not cause an increase in harvest for the current decade. Harvest increases in the current decade (termed the allowable cut effect) are dependent on the existence of surplus volume available for harvest in the decade.

Other features of silvicultural systems that affect TRIM-PLUS outputs are the retention of existing volume in partial cut systems, setting of minimum harvest ages, assumptions about future reforestation success, and assumptions about the funding and performance of stand treatments. Site productivity is assumed to remain constant.

Features of silvicultural regimes that are designed to enhance or protect ecological features or resource values other than timber production impact the potential ASQ. These silvicultural practices include shelterwood retention to provide frost protection or to protect scenic values, canopy retention to assure habitat connectivity, and structural retention regimes.

BRU management intensity levels. Management intensity (MI) is a category within each BRU that is designed to hold a yield table which represents a particular even-age management regime. Up to eight different management intensities can be applied within a given BRU. These MIs represent different combinations of silvicultural treatments to be applied to the acres represented in the BRU. The level of treatment can vary from no treatment to a variety of growth enhancement practices applied on a regular time interval. Specific configuration of the MIs vary within each BRU. Management intensities are configured in two different manners, depending on the general silvicultural regime being modeled (even-age or multiple-canopy).

For *even-age regimes* the configuration is as follows:

MI	DESCRIPTION
1	Untreated residual stands (previously partial cut)
2	Stands with no past management or stands needing conversion
3	Untreated young or second growth stands
4	Commercially thinned and fertilized stands
5	Pre-commercially thinned, commercially thinned, and fertilized stands.
6	Planted 1st generation genetic stock, no treatment
7	Planted 1st generation genetic stock, commercially thinned and fertilized
8	Planted 1st generation genetic stock, pre-commercially and commercially thinned, fertilized
9	Planted 2nd generation genetic stock, no treatment
10	Planted 2nd generation genetic stock, commercially tinned and fertilized
11	Planted 1st generation genetic stock, pre-commercially and commercially thinned, fertilized

The starting condition of each BRU will vary according to the ESC assigned to it. For example, some young stands will start at target stocking levels, while others will start at overstocked or understocked levels. Most present planning area acres are in MI1 and MI2; these acres will shift to different MIs in the future as they are harvested and reestablished *within the model.*

For *multiple canopy* or *uneven-age regimes* the configuration is as follows:

MI	DESCRIPTION
12	Untreated stands projected without harvest entry
13	Growth trajectory and subsequent harvests of stand after the first harvest entry

These MIs are applied to silvicultural regimes that are designed to enhance or protect ecological values, to deal with site factors that prevent even-age management, or to achieve resource management objectives in addition to timber production. These regimes include practices such as shelterwood retention, habitat connectivity regimes, and green tree retention regime.

Within multiple-canopy silvicultural regimes, harvests are designed to either remove entire diameter classes (canopy levels) or remove trees from all diameter classes in either small groups (group selection) or across entire stands (single tree selection). Such regimes do not contain the concept of a final harvest as described in traditional forestry, because a portion of the stand is always retained.

Specific treatment combinations (MIs) are described in the managed stand yield tables completed for each SYU. Acres can be shifted from one MI to another during simulation in TRIM-PLUS runs.

The ORGANON model and future yields. Yields for stands that would be subject to management or that have already received management are estimated using the ORGANON model. Oregon Growth Analysis and Projection System (ORGANON) is a distance-independent, single tree, dynamic model used to project multiple species tree lists under various management practices and stand variables to estimate growth and yield. The model was developed by the Oregon State University based on data from southwestern Oregon. Site index, stand structure, fertilization, thinning, and stand density are some of the variables that ORGANON can use in making yield projections. ORGANON can project even-age or uneven-age stand characteristics and yields for both conifer and hardwood species.

The gross estimate of cubic volume output from ORGANON is adjusted for factors that are not considered in the model, such as defect and breakage, the effects of insects and disease, soil compaction, and the presence of non-stocked openings in the stands. Managed stand yield tables, published for each SYU and available at the KFRA office, provide greater detail on how these adjustments were completed.

Other information available from ORGANON outputs are useful to help characterize the differences between silvicultural systems. Such information includes species composition, stand structure, and crown closure.

TRIM-PLUS ASQ Runs

When all of the acres, volumes, and management assumptions are assembled in the appropriate files in TRIM-PLUS, repeated ASQ runs are made to find the optimal harvest level. Output summaries are reviewed to assure that outputs are correct and reasonable. After the total ASQ run is completed, further analysis of the contribution to the harvest acreage by BRU, resource area, or land status can be made.

The existing suitable commercial forest land is composed primarily of intact older forest stands, partially cut timber stands, and immature stands. Taken as a whole, this forest is capable of producing a particular level of annual growth without management and different levels of annual growth under the various silvicultural systems and practices.

In addition, the forest has a distribution of age classes (not necessarily even-age stands) that reflect both natural disturbance frequencies (such as wildfires) and past harvesting. The distribution of age classes is uneven, with different numbers of acres in each age class. As harvesting proceeds, a point is reached when average annual harvest and growth are in equilibrium. At this point the forest is said to be regulated and the maximum level of sustainable yield is being produced.

Various silvicultural regimes have the capacity to produce timber over time at a wide variety of harvest levels which might be higher or lower than that supported by current growth. To compute an allowable cut based solely on current growth would not permit either the accurate estimation of yield or the estimation of the effects of different silvicultural regimes or treatments. For that reason, the BLM uses an approach that projects growth into the future for the silvicultural system being analyzed.

For a particular general silvicultural system, the volume produced is highest if stands are harvested at a point called the *culmination of mean annual increment* (CMAI), the age at which average annual volume produced by stands begins to decline. Since the age class distribution of the forest is uneven, if harvest occurred only at CMAI, then many acres would be available to harvest in some decades as those acres reached CMAI, and few acres would be available in other decades. A higher level of ASQ is achieved if harvest in some decades is allowed to fall to a mini-

mum harvest age below CMAI, although harvest at or near CMAI will occur in the long run (harvest will not fall to the minimum harvest age and stay there). Restricting harvest at various minimum harvest ages is tested for their effects on several factors, including the ASQ.

If surplus volume is available in the current decade for a forest managed under a particular silvicultural regime, that volume could be harvested within a framework on nondeclining, sustainable yields in the future only if management practices that raise the estimate of long-term yield could be adopted. Such practices include the use of genetically selected stock and forest fertilization in even-age silvicultural systems.

The additional amount of timber that can be harvested in a forest above the minimum harvest age, by taking credit now for future growth increases expected as a result of management actions has been termed the *Allowable Cut Effect* (ACE).

If surplus volume is not available because of past harvesting or because of land use allocations, little or no ACE will be produced regardless of assumptions about long-term yield. The computed ACE for the planning area is considerably below the levels of yield increase associated with silvicultural investments and genetic selection.

East Side Differences

Much of the above discussion on the TRIM-PLUS model and the ASQ calculation process applies to the east side. However, major differences are as follows:

- The east side is not digitized as part of a geographic information system (GIS). Acres, by operations inventory unit, were calculated by use of dot grids. The level of analysis made possible by GIS on the west side is not available on the east side.
- The number of inventory plots available on the east side was 29, a relatively small number.
- Empiric yield curves, based on 29 10-point inventory plots, were used in conjunction with published yield tables for construction of yield curves projecting volume growth on east side stands. (The ORGANON model was not used on the east side, since the database upon which ORGANON was built is in a different geographic region.)
- The same general silvicultural prescription was used to model all the alternatives. The assumption was made that a multiple canopy/uneven-age silvicultural regime on the more xeric east side lands would provide an optimum level of timber production while retaining enough stand components to satisfy the needs of other resource values. The ASQ would vary by alternative mainly with the number of acres available for forest management.

Adjustments to KFRA TRIM-PLUS Acres

In the Lakeview District's portion of the Klamath SYU there are many uneven-age stands that are typically comprised of small patches varying in size, species, and age. Therefore the timber types that TRIM-PLUS proposes to harvest only occur in patches in the harvest unit and not evenly dispersed throughout the entire harvest unit (see figure 2-C-1). The result is that the total acres of the harvest unit entered would be significantly higher than the TRIM-PLUS estimates of acres that would actually be cut. In addition, the volume per acre that would be harvested at the stand level would be lower than the TRIM-PLUS outputs. Due to this situation, TRIM-PLUS acres for the KFRA have been adjusted based on last decades harvest levels, current harvesting levels, and professional judgement to reflect a more realistic harvest acreage associated with the TRIM-PLUS harvest levels (ASQs) for the alternatives.

Silvicultural Systems And Practices Considered In The Common Alternatives

Even-age Systems

Clearcut harvest. Clearcut harvest is an even-age reproductive cutting method in which an entire stand or specified geographical unit is harvested in a single entry with the exception of wildlife trees or snags. The objective of clearcutting is to provide the necessary site conditions required for the establishment of a new even-age stand. Regeneration is obtained either by artificial or natural means; planting seedlings is the most typical form of regeneration. Natural regeneration may occur through seed dispersal from trees in adjacent timber stands. Clearcut harvest may occur in previously unentered stands or in stands previously subject to management, including failed shelterwood, commercial thinning, or salvage entries.

Overstory removal. Overstory removal of natural stands is a harvest entry into a previously unentered stand designed to remove the largest, oldest timber and release the naturally occurring understory regeneration. This type of entry will move a natural stand toward a more even-age condition.

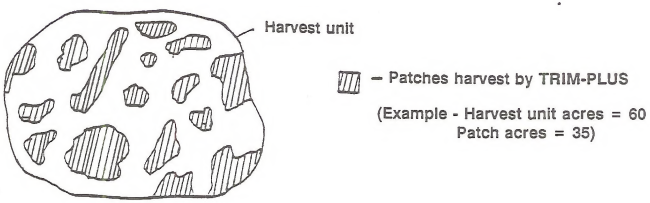


Figure 2-C-1

Shelterwood harvest. The shelterwood system removes mature timber in a series of harvest entries and results in the establishment of an essentially even-age stand under the partial shelter of residual trees. Shelterwood harvest units are typically subjected to artificial regeneration techniques, usually planting; however natural regeneration within shelterwood units can also be significant. The number of trees retained in the shelterwood system will vary according to site and stand characteristics, as well as management objectives for the site. These objectives may include providing the appropriate environment for the establishment of seedlings of a desired species, protection of scenic quality, or frost protection in areas prone to late spring and summer frosts. Individual trees reserved under the initial entry of the shelterwood system are harvested later in a harvest operation called a *shelterwood removal.* Typically, where the understory tree species is resistent to frost damage, a shelterwood removal entry will be scheduled within five years of completion of the initial shelterwood harvest; this allows the newly established seedlings to take full advantage of site resources without competition from the overstory trees. Under a *shelterwood retention* system, management objectives may require that individual trees be retained on a site for a period of up to 30 years after the initial entry.

Seed tree system. The seed tree system retains a prescribed number of residual trees per acre (usually 3 to 10) during the regeneration cutting. The silvicultural objective of this system is the establishment of a new even-age stand. Reforestation on sites harvested under this method occurs from natural seed provided by the residual trees. Artificial regeneration techniques, usually planting, may be used to augment the natural regeneration, if necessary. Following seedling establishment, the seed trees may or may not be harvested, depending on the management objectives for the area.

Uneven-age Systems

Selection system. The selection system is a method of uneven-age management involving the harvest of either single trees from stands *(single tree selection)* or groups of trees *(group selection)* without harvesting the entire stand at any one time. Harvest may involve either the removal of the largest trees in the stand or cutting across the entire diameter distribution. *Small patch clearcuts,* generally less than five acres, are also considered to be a component of the selection system. Under this harvest system, natural regeneration is encouraged, although planting would be used to augment natural regeneration. Uneven-age stand characteristics are maintained. Without site disturbance and significant reduction of basal area (through harvest or natural processes), this system may result in a timber stand experiencing a seral shift toward more shade-tolerant species.

Green tree retention systems. Green tree retention systems are modifications of current stand management practices in which live trees, as well as snags and large down wood, are left as structural components within harvest units to provide habitat components over the next management cycle. The level of retention varies both by major plant grouping and

management objectives. *High level green tree retention* is a regeneration harvest designed to retain the highest level of live trees possible while providing enough disturbance to allow regeneration and growth of the naturally occurring species mixture, including shade-intolerant species. Harvest design would also retain cover and structural features necessary to provide foraging and dispersal habitat for mature and old growth dependant species. *Low level green tree retention* is a regeneration harvest designed to retain only enough green trees and other structural components to result in the development of stands that meet old growth definitions within 100 to 120 years after harvest entry.

The 50-11-40 rule. The 50-11-40 rule is a proposed guideline requiring maintenance of adequate northern spotted owl dispersal habitat on lands outside designated habitat conservation areas (HCAs). It would ensure that, on a quarter township basis, 50 percent of the remaining stands would have conifers averaging 11 inches diameter at breast height and a 40 percent canopy closure.

Rationale for Selection of a Silvicultural System

The prescription of silvicultural systems for a particular area is a three-tiered process. Silvicultural prescriptions must be linked to the management objectives and resource allocations for that area; this would include consideration of the biological potential of the site and the environmental needs of a desired species. Additionally, the selected method must ensure that the harvested lands can be adequately restocked with desired species in a manner that minimizes risk from insects, diseases, and wildfires. Finally, harvest methods must also consider logging systems and economics. An explanation of some of the considerations is provided as follows.

Management objectives and resource allocations for the site. An area allocated to high timber production will often receive a different type of harvest than areas allocated to rural interface or scenic quality, but on which timber harvest is allowed. Although the level of timber production would vary under each of these objectives, silvicultural systems can be designed to allow both the harvest of a specified level of timber and the regeneration of desired species.

The environmental requirements of individual tree species. For example, any particular species of conifer has a known ability to survive and thrive in shade, which is referred to as *shade tolerance*. In general, pine species are classified as intolerant. If part of the management objective is to provide for pine regeneration, the use of a silvicultural system that retains excessive canopy cover would not be appropriate, because the canopy shades the forest floor. Species such as shasta red fir are classified as very tolerant, and will survive and grow in shade provided by uneven-age silvicultural systems. Other environmental factors to consider include, but are not limited to, soil type, elevation, aspect, soil moisture regimes, and presence of pathogens.

Logging practicality. The ability to successfully implement any silviculture system is directly linked to the ability to log a given site to meet the objectives of the system. For example, cable logging in a dense stand prescribed for a selection harvest may result in unacceptable levels of damage to the trees designated as reserved for the next timber stand. Logging practicality can be limited by many factors, including topographic features, road locations, harvest unit shape, equipment limitations, previous harvest patterns, and even the prescribed silviculture system itself.

For the RMP, a number of general silvicultural prescriptions are being proposed. The general prescriptions will be modified to reflect site characteristics, existing stand conditions, management objectives, and resource allocations. However, some generalizations can be made concerning the use of particular silvicultural systems.

Even-age silvicultural systems can be used when the desired coniferous regeneration is a species that can be established and grown in conditions of full sunlight. Ponderosa pine and sugar pine are classified as shade intolerant and require full sunlight for maximum growth. Douglas fir is classified as intermediate in shade tolerance. Newly planted seedlings can become established in partial shade, such as when shelterwood trees are retained to provide frost protection. Once established, however, Douglas fir grows to its highest potential in full sunlight.

Uneven-age silvicultural systems are designed to create a managed stand that is composed of many layers of canopy trees in a mosaic of small patches across the landscape. Using uneven-age systems, timber stands can be managed to provide regeneration opportunities for a variety of commercial confers, varying from shade intolerant to shade tolerant species. This is accomplished by varying the size of artificially-created openings within the stand. Ponderosa pine and mixed conifer stands containing ponderosa pine, sugar pine, Douglas fir, shasta red fir, incense cedar, and white fir present uneven-age management opportunities.

In situations where management objectives dictate a high level of timber production, uneven-age systems would have limited application for Douglas fir, which can be successfully regenerated under even-age regimes. Uneven-age systems may have applicability where management objectives or other resource values take precedence over timber production.

Implementation of 50-11-40 prescriptions would theoretically provide for maintenance of adequate northern spotted owl dispersal habitat on lands outside HCAs.

Selection of a Silvicultural System

The following examples describe scenarios in which the clearcut harvest method would be the favored silvicultural system, if the predominant management objective was timber production.

- Areas where a protective overstory canopy is not required to modify a hot, dry microsite or mitigate frost damage problems for seedling establishment.
- Stands with a high potential for windthrow which would result in blowdown of residual trees.
- Stands with disease problems that would infect residual trees or newly established seedlings.
- Existing stands where the amount of overstory is so large that unacceptable levels of logging damage would occur to seedlings or other understory, and where environmental factors do not require modification of the system.
- When the management objective is to regenerate a shade-intolerant conifer species.

The following are some examples of where the shelterwood or seed tree method could be the favored silvicultural system, depending on management objectives for the area.

- Hot areas susceptible to drought with shallow, skeletal soils, where artificial reforestation techniques alone are ineffective in modifying site conditions sufficiently to favor seedling establishment.
- Areas with flat topography (which restricts frigid air drainage) where frost damage may reduce seedling survival.
- Areas identified as having high scenic quality. In these areas, the goals of the visual resource guidelines may dictate a shelterwood which could vary the overstory volume, length of time for shelterwood removal, or type of logging employed.
- Designated rural interface areas.

The following are some examples of where uneven-age systems could be the favored silvicultural system.

- Harvests designed to retain suitable habitat for the northern spotted owl, as identified in the Interagency Scientific Committee Report (the 50-11-40 rule).
- Density management harvests designed to accelerate the attainment of old growth characteristics within old growth reserve blocks.
- Green tree retention cuts designed to retain important ecologic features of existing unentered or lightly entered timber stands.
- Hot areas susceptible to drought with shallow, skeletal soils, where artificial reforestation techniques alone are ineffective in modifying site conditions sufficiently to favor seedling establishment.

BLM'S Genetic Selection Program And The Genetic Diversity Of Selected Species

Tree improvement programs in Oregon and the northwest are designed to increase the production of wood fiber. Current methodology also addresses concerns for conserving and enhancing genetic diversity of selected species as the basis for future genetic adaptation (Daniels 1990). The BLM's tree improvement program has been designed with this criteria to provide opportunities for meeting unforeseen future needs.

The growth enhancement and resistance to disease estimated from genetic tree selection is based on the ability to detect and select desired traits from the genetic variation naturally present in tree species. Through management, the frequency of selected traits is increased in proportion to the host of other traits present in the total population.

Douglas fir exhibits high levels of genetic variability relative to other forest tree species. Studies of genetic diversity in coastal Douglas fir have consistently shown that a great deal of variation exists in this species for genes controlling quantitative traits (Silen 1978). Considerable variability is also indicated by physiological, morphological, and other biochemical data. This variability is great both within individual stands and between stands located across a wide range of geographic and environmental conditions. This data suggests that to conserve natural genetic diversity it will be necessary to establish programs that maintain variations both within stands and between stands.

The BLM is a member of the Northwest Tree Improvement Cooperative, which encompasses lands owned by federal, state, county, and private organizations. The cooperative has subdivided the participating land base into specific breeding units. These units have been defined by differences in geography and elevation and appear to differ genetically from unit to unit. Breeding units range from 30,000 to 200,000 acres, depending on the perceived environmental variation present. There are approximately 70 breeding units, comprising about six million acres of forest land. The breeding units are intended to maintain and conserve the genetic diversity within and between populations (stands) of selected tree species.

Project design used to enhance gene conservation includes selection of large numbers of parent trees within each breeding unit. This number varies with the size of the breeding unit, ranging from 160 to 900 parent trees per unit. Parent trees are selected on the basis of easily measurable growth characteristics, such as age, growth rate, form, and vigor. The combination of numerous breeding units and the selection of hundreds of parent trees per unit provides a broad genetic base for the breeding program and seed orchard development.

A third feature of the cooperative program that contributes to gene conservation is the establishment of progeny test sites. Parent trees selected for breeding and seed orchard use undergo a standardized field testing of their offspring. A series of progeny tests, containing 6 to 12 test plantations, are established within every breeding unit. Each test plantation contains several thousand well maintained and identified test trees. Approximately 650 progeny test sites containing nearly 3 million individual trees have been established. At least one parent is known for each tested individual. Growth data for each individual is systematically collected, analyzed, and stored for both short-term and long-term use. These test sites make up a reservoir of genetic diversity from local gene pools of the selected tree species throughout the region. They are an invaluable source of information and material for forest research and the improvement of forest management.

The BLM's western Oregon tree improvement program contains 52 Douglas fir breeding units; a seed orchard will be established for each of these. Seed orchards consist of 50 to 100 unrelated parent trees, each selected for its superior growth rate and stable performance across the breeding unit, as demonstrated in the progeny test sites. Studies have shown that for quantitative traits (such as growth rate) the number of different genotypes that can be generated through recombination is extremely large (Kang 1980). Therefore, a very diverse population can be created from a relatively small number of individuals that show some genetic diversity; and seed orchards will provide ample quantitative genetic variability.

Seed orchards will be used for the production of seed for reforestation, using parent trees selected primarily for stable performance and rapid growth rates. Such selection would reduce the frequency of certain characteristics in the total population; it would not completely eliminate those characteristics that presently appear less desirable. The gene pool could actually be broadened by cross breeding trees that would otherwise be unable to cross pollinate naturally due to physical separation.

Tree breeding has not resulted in dangerous uniformity in forestry (Ledig 1988). Adams (1981) studied isozymes of Douglas fir and reported that plantations reforested from the first generation seed orchards are not appreciably less variable than natural populations in the same breeding units, and certainly would be as variable, if not more so, than plantations regenerated from seed of commercial collections or seed trees. He further concluded that tree improvement efforts may lead to a broader genetic population base than that occurring with present regeneration, at least in the earlier generations of breeding programs. Care must be taken to insure that outstandingly superior lines are not overused over time to maximize growth (Ledig 1988).

On the west side of the Klamath Falls Resource Area, full development of a genetic tree improvement program for Douglas fir is limited by the species' low resistance to frost damage during the growing season. An overstory of trees sufficient to insulate young trees from frost damage must be maintained until the trees are approximately 25 to 30 feet tall. However, maintaining such an overstory suppresses growth of the understory. Establishment of progeny test sites for Douglas fir in this area is almost impossible, since nearly uniform growing conditions necessary for a meaningful test of growth rates cannot be created.

The sugar pine tree improvement program has focused on identifying those parent trees that are resistant to the white pine blister rust. For over 30 years, the BLM has worked with the U.S. Forest Service to build a population of sugar pine trees in southwest Oregon that are known to resist the effects of the disease.

Hundreds of disease-resistant parents have been identified by testing thousands of apparently resistant sugar pines in ten breeding zones. These resistant parents are used for cone collections and for establishment of seed orchards. The combination of characteristics produced in the seed orchard quickly yields a

diversity of genetic disease-resistance mechanisms in the sugar pine population that would be impossible under natural forest conditions.

The Effects on Biological Diversity section in chapter 4 contains a discussion of the effects of timber management on genetic diversity.

Description Of Silvicultural Systems - Preferred Alternative

On the east side's more xeric sites and on the cold, dry sites on the west side, prescriptions would have a goal of retaining biological diversity and ecosystem stability while maintaining a high, sustainable level of timber production. These stands are more difficult to reforest or maintain under even-age management than the current species and structure; therefore, uneven-age/ multiple canopy management would be implemented.

General prescription. The general silvicultural prescription for the Preferred alternative would involve management strategies and levels of green tree retention that are thought to mimic natural ecological processes and retain species diversity, structural diversity, and landscape diversity. Regeneration harvesting (see Glossary) would involve use of group selection or individual tree selection strategies. The general landscape would be managed to retain enough basal area to provide desired levels of protection from frost, gophers, and vegetation that inhibits reforestation success, as well as to provide the structural features required to meet target stand objectives. The level of basal area retention would meet habitat connectivity goals in the general landscape, with higher levels left to meet the needs of specific sites, stands, or management objectives. Species diversity would be maintained through design of harvest entry type (patch size and density of reserved overstory) and species retained. Harvest entries would reserve adequate snags and down woody debris to meet wildlife and biodiversity objectives. Reserve trees would represent the average quality of trees in the units, except where selection of reserved trees must be made against disease. No minimum harvest age is specified because harvest may occur across the entire range of age and diameter classes.

The location of reserved trees or patches would be based on consideration of special status species, wildlife habitat features, wet areas, resistance to windthrow, logging system designs, reforestation, species diversity requirements, and other considerations as directed by the area manager.

Within units managed to meet this prescription, stream buffers would be maintained to meet riparian management standards and goals. Adequate reserve trees would be retained to meet coarse woody debris goals for streams.

The general sequence and kind of silvicultural treatments used on stands managed under these prescriptions would differ from even-age management regimes. Where feasible, site preparation prescriptions that mimic natural disturbances would be used. Prescribed fire and vegetation management practices would be used to assure the production of wildlife forage compatible with the achievement of stand regeneration and growth objectives. In stands where a small log/biomass (wood fiber) harvest would be uneconomical, pre-commercial thinning would be required to meet base harvest levels. Decadal accomplishment targets would be set for pre-commercial thinning practice as well as for vegetation management actions in even-age units. Other intensive forest management practices, such as planting 50 percent of the stand with genetically selected stock, herbicide use, and forest fertilization could be used as needed to meet stand management goals. The impact of intensive practices on yields within these prescriptions is uncertain and were not used in ASQ estimations. The acres on which these treatments would be needed are also uncertain and therefore decadal treatment targets were not set.

Regeneration harvests would be scheduled at 120-year intervals for any specific landscape patch, but use of group selections in specific stands would result in multiple regeneration entries within the 120-year period. Intermediate density management entries would be scheduled to harvest surplus volume, maintain or enhance stand diversity, and maintain stand vigor and health.

Adequate reserve trees would be retained, and allowed to die and fall to the forest floor to meet long-term snag and woody debris goals. Structures would be left to adequately meet a minimum of 60 percent of the optimum habitat requirements for cavity dweller species, such as woodpeckers.

Special Prescriptions

Protected habitat area buffers (PHABs). Within 1/4 mile of each protected habitat area (PHA) a buffer (PHAB) would be established. Within the PHABs, the management objective would be to maintain at least 70 percent of the current old growth habitat. Prescriptions for the PHABs would be developed to maintain or improve old growth habitat, and only secondarily to

provide timber production. A light harvest would occur during each decade, with approximately five percent of the stand removed. This light entry would remove a volume of timber equal to the decadal growth and/or mortality. The size of harvest patches could be as small as a single tree or as large as three acres. Stand parameters, including crown closure, basal area, reserve trees, and trees per acre would be higher than in the general forest management area. With high levels of overstory retention, these sites would tend to experience a seral shift away from early seral species.

Within the general forest management area, the goal would be to move towards uneven-age/multiple canopy management by maintaining or establishing multiple age classes, including a component of older trees, species diversity, and dead and down material. In order to maintain forest health, stocking level management would have a goal of minimizing loss from drought, insects, and diseases. Consumption of excess residual slash not contributing to the dead and down component would be encouraged. Timber volumes would be harvested during a density management or commercial thinning entry, partial cut entry, and/or at the time of the regeneration harvest. Density management or commercial thinning entries would have a goal of accelerating seral development and producing old growth characteristics as rapidly as possible while maintaining forest characteristics required for habitat connectivity and immediate habitat usefulness. Clearcuts would only be used where silviculturally essential to accomplish forest management or other resource objectives, such as salvage or wildlife enhancement. Biomass (wood fiber) could be harvested concurrently with one of the above entries. Immediately after the regeneration harvest, these stands would have the ecological characteristics of early seral forests, but would retain enough green trees and other structural components (biological legacies) to result in the development of stands that meet old growth definitions within 100 to 120 years. Post harvest stands would retain a range of sizes of dominant and larger co-dominant trees. Retention of snags, coarse woody debris, and vertical structure would be included in the silvicultural prescriptions.

Timber sales and silvicultural prescriptions would be designed to encourage natural regeneration following timber harvest; however, to minimize the regeneration period, artificial regeneration would be used to supplement natural reforestation. Regeneration harvests that would open a forest enough to establish a desired tree species would be achieved through partial cutting, shelterwood retention, group selection (small patch clearcuts), or a combination of these. Uneven-age/multiple canopy management would be extensively used on both the west and east sides. A mix of native species would be planted to help assure species diversity. Planting would occur at minimum densities. A maximum of 50 percent of planting stock within a reforestation unit would be grown from genetically-selected Douglas fir seed. This seed would be collected either from selected superior trees growing in natural stands or from seed orchards developed from selected superior trees.

Transportation system. Logging and transportation systems would be designed to support the recommended silvicultural prescriptions. New roads would be constructed to standards appropriate to the expected use and at a density consistent with resource protection and multiple use. Road management actions, including closures, would incorporate biodiversity and multiple use needs. Timber sales would be consolidated into large blocks (for example, analytical watersheds or sections) as compatible with other resources. Low-impact harvesting techniques would be used where possible to minimize soil disturbance. Designated skid trails, cable yarding, low ground pressure equipment and/or seasonal restrictions would be required. Where feasible, site preparation prescriptions that mimic natural disturbances would be used. Previously used skid trails that would not be part of the designated skid trail system would be ripped. The sale of forest products would be designed to encourage full use of harvested timber. These sales would be designed to reserve ecological site features (such as snags and coarse woody debris) and to provide for wildlife and other resource needs.

Density Management

To maintain high tree vigor and minimize the risk of insect attack, heavy thinnings could be prescribed. Thinnings could occur in stands with trees ranging in diameter from 2 to 20 inches and in age from 20 to 100 years. To meet seral diversity or wildlife habitat goals, density management could also be prescribed to accelerate the development of older stand structures . Fertilization could be combined with density management to offset thinning shock and to increase stand vigor.

Partial Cut Stands Or Stands With Light Overstories

Those stands that have already been subject to partial cut entries or that have naturally light overstories would be managed to retain a required number of large green trees (often 12 or more). If the number of large trees remaining above the required number does not provide for an economically viable entry, no harvest entry would be made.

Management Of Young Stands

Existing even-age stands and plantations would be managed according to the normal density standards used for even-age stands, but could receive commercial density management entries that accelerate the development of diversity within the stand. Regeneration harvests in these stands would be based on achievement of biological diversity objectives. Pine plantations on mixed conifer sites would be managed to achieve natural species mixtures over time through commercial density management and regeneration entries.

Timber Harvest and Management Details

Yield Effects of Intensive Practices

For most of the alternatives analyzed in chapter 4, future ASQs would be potentially higher than those projected for the next decade. For even-age regimes, the ASQ would tend to increase over time as the forest developed a balanced age-class distribution. For shelterwood retention and structural retention regimes, the current decade ASQ is limited by reservation of standing volume. Available volume would increase in the future. For all systems, silvicultural investments would increase growth and increase future volume above current harvest levels.

Under alternative C, provision was made for the harvest of timber from the blocks of land designated for restoration and retention of mature and old growth forest. For the Medford and Lakeview Districts, this volume was judged to be too small to be included in the available volume estimates. Partial cuttings from these blocks would be designed to accelerate development of old growth structural characteristics in younger stands contained in the blocks.

For silvicultural systems that retain overstories the effects of intensive practices on yield is uncertain and no yield increase was assumed in making ASQ computations. Table 2-C-1 shows the yield increases determined for treatments for the principle silvicultural systems utilized in each alternative.

Board Foot/Cubic Foot Ratios

The ASQ would be greatest under alternative NA and least under alternative E, with the ASQ for the other alternatives falling between those extremes. The ASQ is defined as an annual even-flow quantity based on cubic foot measure; however, the board foot equivalent could change over time with the size of timber harvested. Board foot equivalents are shown for future decades in table 2-C-2.

Table 2-C-1. Yield Gains Assumed from Silvicultural Practices by Silvicultural System (at 100 Years)

	Alternatives		
Silvicultural Practice	NA, A, and B (percent)	C, D, and E (percent)	Preferred (percent)
PCT	6.4	11.1	11.1
PCT and F	10.6	0	0
PCT and CT	18.2	11.1	11.1
PCT/CT/F	20.1	0	0
Genetics			
Level 1	4.5	0	0
Level 2	8.8	0	0
Genetics Plus PCT/CT/F	30.5	0	0

Abbreviations used:
PCT = pre-commercial thinning
CT = commercial thinning
F = fertilization
0 = no increase in yield assumed

Table 2-C-2. Allowable Sale Quantity (ASQ) Board Foot/Cubic Foot Ratios by Decade.

Alternative	1st	2nd	3rd	5th	10th	20th
			West Side			
No Action	5.74	5.88	6.15	5.70	5.06	6.42
A	5.61	5.70	5.76	5.86	6.07	6.15
B	5.67	5.74	5.78	5.87	6.07	6.17
C	5.73	5.82	5.89	6.01	6.18	6.27
D	5.74	5.83	5.81	5.80	6.12	6.23
E	5.61	5.73	5.75	5.81	6.00	6.21
Preferred	5.72	5.81	5.88	6.06	6.19	6.19
			East Side			
No Action	5.17	5.25	5.18	5.23	5.15	5.41
A	5.17	5.25	5.18	5.23	5.15	5.41
B	5.17	5.25	5.18	5.23	5.15	5.41
C	5.17	5.25	5.18	5.23	5.15	5.41
D	5.17	5.25	5.18	5.23	5.15	5.41
E	5.17	5.25	5.18	5.23	5.15	5.41
Preferred	5.17	5.25	5.18	5.23	5.15	5.41

Allowable Sale Quantity for the Preferred Alternative by Sustained Yield Units

Allowable sale quantities are calculated by geographic area, or sustained yield unit, rather than by district. The Klamath sustained yield unit is shared by the Medford and Lakeview Districts. Table 2-C-3 shows the ASQ determined for the preferred alternative by sustained yield unit and the split between Medford and Lakeview districts. Also shown is the ASQ for the east side of the Klamath Falls Resource Area.

Expected Preferred Alternative Harvest by Allocations and Decade

Table 2-C-4 shows the potential harvest for the Preferred alternative by allocations area.

Preferred Alternative Assumed Stand Treatments by Decade

Table 2-C-5 shows the assumed stand treatments by decade for the Preferred alternative.

Table 2-C-3. Preferred Alternative Harvest by Sustained Yield Unit

SYU	1st Decade	2nd Decade	3rd Decade	5th Decade	10th Decade
Klamath SYU (total)[1]					
mmbf	82.9	84.2	85.1	87.8	89.6
mmcf	14.484	14.484	14.484	14.484	14.484
West Side of the KFRA[2]					
mmbf	44.5	47.1	49.5	52.1	52.1
mmcf	7.786	8.098	8.427	8.637	8.421
East Side of the KFRA[3]					
mmbf	1.28	1.30	1.28	1.29	1.34
mmcf	2.485	2.485	2.485	2.485	2.485

[1]Includes both Medford (Ashland Resource Area) and Lakeview (Klamath Falls Resource Area) Districts' portions of SYU.
[2]Includes only the Lakeview District's portion of Klamath SYU.
[3]The east side of the Klamath Falls Resource Area is not a declared SYU.

Abbreviations used in this table:
SYU - sustained yield unit
mmbf - million board feet
mmcf - million cubic feet

Table 2-C-4. Expected Preferred Alternative Harvest by Sustained Yield Unit (acres and mmcf/decade)

	1st Decade		2nd Decade		3rd Decade		5th Decade		10th Decade	
West Side of the KFRA[1]	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume
Old Growth Ecosystem Areas[2]	0	0	0	0	0	0	0	0	0	0
Connectivity Areas[2]	0	0	0	0	0	0	0	0	0	0
General Forest Management Area										
Regeneration Harvest	590	1.625	434	1.688	711	1.758	909	1.803	1,118	1.757
Commercial Thinning/Density Management/Uneven-age	3,355	6.160	2,472	6.409	4,043	6.669	5,167	6.834	6,358	6.664
Eastside of the KFRA[3]										
Old Growth Ecosystem Areas[2]	0	0	0	0	0	0	0	0	0	0
Connectivity Areas[2]	0	0	0	0	0	0	0	0	0	0
General Forest Management Area										
Regeneration Harvest	640	.389	1,265	1.399	101	.062	397	.381	647	.947
Commercial Thinning/Density Management/Uneven-age	5,160	2.095	1,472	1.086	5,873	2.422	3,285	2.104	1,577	1.538

[1]Includes only the Lakeview District's (Klamath Falls Resource Area) portion of the Klamath SYU.
[2]Not applicable - no old growth emphasis areas or connectivity areas were designed in the Klamath Falls Resource Area.
[3]The east side of the Klamath Falls Resource Area is not a declared SYU.

Table 2-C-5. Preferred Alternative Assumed Stand Treatments by Decade (acres)

West Side	1st Decade	2nd Decade	3rd Decade	5th Decade	10th Decade
Plant Genetically Selected Stock	1,000	1,015	1,030	1,056	1,103
Competing Vegetation Control	2,500	3,225	895	1,213	1,528
Pre-commercial Thinning	500	791	3,055	829	1,215
Fertilization	320	1,290	4,125	2,196	2,898
East Side					
Plant Genetically Selected Stock	310	315	319	327	342
Competing Vegetation Control	414	3,440	409	401	431
Pre-commercial Thinning	354	274	2,563	871	1,277

Appendix 2-D
Recreation

Introduction

This appendix has two parts. The first section is a table showing proposed management of areas that were dropped from consideration as areas of critical environmental concern (ACEC). The second part describes six classes of recreation management that are proposed for use in the various alternatives.

Potential Management of Candidate ACECs Dropped from ACEC Consideration

Area Name	Acres Dropped	Description (Primary Values)	Alternative	Managed For
Lower Goodlow Mountain	1,760	Plant communities related to Goodlow Mountain RNA.	NA/A-E/PA	No special management. Plant communities present on BLM lands do not differ appreciably from those already protected in the existing RNA.
Barnes Valley Creek	480	Scenic value, water quality concerns	NA	100 foot no cut buffer, VRM II management.
			A,B	Riparian management area, minimum 75-100 foot buffer either side of high water mark.
			C-E/PA	Riparian management area, minimum 150-200 foot buffer either side of high water mark, VRM II management.
Alkali Lake	240	Riparian/Wetland	NA/A/B	No special management other then to consider/pursue land exchange opportunities.
			C-E/PA	Actively pursue land exchange opportunities, control grazing by fencing, ORV use limited. (See table 2-6.)
Clover Creek Forest Education	30	Forest Education	NA/A/B	No special Management
			C-E/PA	Restricted timber harvest to meet objectives of forestry tour site. (See table 2-6.)

Recreation Opportunity Spectrum (ROS) Classes

The following chart describes each of the six ROS classes in terms of experience opportunities; setting opportunities, and activity opportunities. These descriptors provide a general overview of the opportunities included in each class. These overview statements do not describe each class in detail, but rather provide a point of departure from which the planner or manager can develop more precise prescriptions for each class based on specific situations encountered in field operations. The listing of activity opportunities is provided for illustrative purposes. It is not an all-inclusive list of activity opportunities on the public lands.

The Recreation Opportunity Spectrum Class Descriptions

Opportunity Class	Experience Opportunity	Setting Opportunity	Activity Opportunity
Primitive	Opportunity for isolation from the sights and sounds of people, to feel a part of the natural environment, to have a high degree of challenge and risk, and to use outdoor skills.	Area is characterized by essentially unmodified natural environment of fairly large size. Concentration of users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of induced restrictions and controls. Only facilities essential for resource protection are used. No facilities for comfort or convenience of the user are provided. Spacing of groups is informal and dispersed to minimize contacts between groups. Motorized use within the area is not permitted.	Camping, hiking, climbing, enjoying scenery or natural features, nature study, photography, spelunking, hunting (big game, small game, upland birds, waterfowl), ski touring and snowshoeing, swimming, diving (skin and scuba), fishing, canoeing, sailing, and river running (non-motorized craft).
Semi-Primitive Nonmotorized	Some opportunity for isolation from the sights and sounds of people, but not as important as for primitive opportunities. Opportunity to have high degree of interaction with the natural environment, to have moderate challenge and risk, and to use outdoor skills.	Area is characterized by a predominantly unmodified natural environment of moderate to large size. Concentration of users is low, but there is often evidence of other area users. On-site controls and restrictions may be present, but are subtle. Facilities are provided for the protection of resource values and the safety of users only. Spacing of groups may be formalized to disperse use and limit contacts between groups. Motorized use is not permitted.	Camping, hiking, climbing, enjoying scenery or natural features, nature study, photography, spelunking, hunting (big game, small game, upland birds, waterfowl), ski touring and snowshoeing, swimming, diving (skin and scuba), fishing, canoeing, sailing, and river running (non-motorized craft).

The Recreation Opportunity Spectrum Class Descriptions (cont.)

Opportunity Class	Experience Opportunity	Setting Opportunity	Activity Opportunity
Semi-Primitive Motorized	Some opportunity for isolation from the sights and sounds of people, but not as important as for primitive opportunities. Opportunity to have high degree of interaction with the natural environment, to have moderate challenge and risk, and to use outdoor skills. Explicit opportunity to use motorized equipment while in the area.	Area is characterized by a predominantly unmodified natural environment of moderate to large size. Concentration of users is low, but there is often evidence of other area users. On-site controls and restrictions may be present, but are subtle. Facilities are provided for the protection of resource values and safety of users only. Spacing of groups may be formalized to disperse use and limit contacts between groups. Motorized use is permitted.	Same as the Semi-Primitive Nonmotorized, plus the following: ORV Use (4-WD, dune buggy, dirt bike, snow-mobile), power boating.
Roaded Natural	About equal opportunities for affiliation with other user groups and for isolation from sights and sounds of man. Opportunity to have a high degree of interaction with the natural environment. Challenge and risk opportunities are not very important, except in specific challenging activities. Practice of outdoor skills may be important. Opportunities for both motorized and nonmotorized recreation are present.	Area is characterized by a generally natural environment with moderate evidence of the sights and sounds of people. Resource modification and use practices are evident, but harmonize with the natural environment. Concentration of users is low to moderate with facilities sometimes provided for group activity. On-site controls and restrictions offer a sense of security. Rustic facilities are provided for user convenience as well as for safety and resource protection. Conventional motorized use is provided for in construction standards and design of facilities.	All activities listed previously, plus the following: picnicking, rock collecting, wood gathering, auto touring, downhill skiing, snowplay, ice skating, waterskiing and other water sports, hang gliding, interpretive use, rustic resorts and organized camps.

The Recreation Opportunity Spectrum Class Descriptions (cont.)

Opportunity Class	Experience Opportunity	Setting Opportunity	Activity Opportunity
Rural	Opportunities to experience affiliation with individuals and groups are prevalent as is the convenience of sites and opportunities. These factors are generally more important than the natural setting. Opportunities for wildland challenges, risk taking, and testing of outdoor skills are unimportant, except in those activities involving challenge and risk.	Area is characterized by substantially modified natural environment. Resource modification and utilization practices are obvious. Sights and sounds of people are readily evident, and the concentration of users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities are often provided for specific activities. Developed sites, roads and trails, are designed for moderate to high use. Moderate densities are provided far away from developed sites. Facilities for intensive motorized use are available.	All activities listed previously, plus the following: competitive games, spectator sports, bicycling, jogging, outdoor concerts, and modern resorts.
Modern Urban	Opportunities to experience affiliation with individuals and groups are prevalent as is the convenience of sites and opportunities. Experiencing the natural environment and the use of outdoor skills are largely unimportant.	Area is characterized by a highly modified environment, although the background may have natural elements. Vegetation is often exotic and manicured. Soil may be protected by surfacing. Sights and sounds of people, on-site, predominate. Large numbers of users can be expected. Modern facilities are provided for the use and convenience of large numbers of people. Controls and restrictions are obvious and numerous. Facilities for high intensity motor use and parking are present with forms of mass transit often available.	All activities listed previously.

Appendix 2-E
Wild and Scenic Rivers

Introduction

This appendix is comprised of four major sections. The first section, Management Guidelines and Standards for National Wild and Scenic Rivers, applies to BLM-administered lands along both formally designated rivers and, on an interim basis, along eligible rivers. Also discussed in this section are the Oregon Scenic Waterways Act and management constraints on private lands. The second section, Wild and Scenic River Eligibility and Classification Determinations, describes the criteria used to determine the eligibility and highest potential classification of a study river. The third section, Wild and Scenic River Suitability Assessments, contains five assessments for the six river segments in the planning area that were found to be eligible. This section includes a summary of the eligibility and classification determinations for each of the rivers. The fourth and final section, Proposed Action for the Upper Klamath River in California, is excerpted from the Redding (California) Resource Area BLM Draft RMP/EIS (March 1991). It was included to give the reader a more complete picture of how the entire eligible stretch of the river (segment 2 in Oregon and segment 3 in California) is proposed to be managed, since management of adjoining sections is more reasonable.

Management Guidelines and Standards for National Wild and Scenic Rivers

The Wild and Scenic Rivers Act (Public Law 90-542 as amended) established a method for providing federal protection for certain of our remaining free-flowing rivers, and preserving them and their immediate environments for the use and enjoyment of present and future generations. Rivers are included in the system so that they may benefit from the protective management and control of development for which the Act provides. The following guidelines and standards are extracted in part from the February 3, 1970 and August 26, 1982 joint Department of the Interior and Department of Agriculture guidelines. They would apply to BLM-administered lands along formally designated rivers through incorporation in formal management plans, which are normally developed within three years of designation. The guidelines also apply, on an interim basis, to BLM-administered lands along BLM study rivers, as well as other rivers or river segments that have been found by the Bureau to be eligible for consideration as components of the National Wild and Scenic River System (NWSRS). In the latter instance, interim application of the guidelines would continue until lifted by a determination of nonsuitability through BLM's planning (RMP) process or by Congressional action.

Section 10(a) of the Act states that:

> "Each component of the National Wild and Scenic Rivers System shall be administered in such a manner as to protect and enhance the values which caused it to be included in said system without, insofar as is consistent therewith, limiting other uses that do not substantially interfere with public use and enjoyment of these values. In such administration, primary emphasis shall be given to protecting its esthetic, scenic, historic, archaeologic, and scientific features. Management plans for any such component may establish varying degrees of intensity for its protection and development, based on the special attributes of the area."

This section is interpreted by the Secretaries of the Interior and Agriculture as stating that all designated river areas, regardless of classification, will be enhanced and not degraded.

The Congress with Presidential approval may determine which river segments will be added to the NWSRS. When a river is designated, and the BLM is identified as the administering federal agency, the BLM will establish administrative boundaries to protect the identified outstandingly remarkable values (ORVs). By law, the land inside the boundaries normally may not exceed an average of 320 acres per river mile over the designated portion of the river. The BLM would delineate boundaries based on natural or developed features (canyon rims, roads, ridge tops, etc.) and with consideration of legally identifiable property lines.

A river management plan must be also completed by the administering federal agency within three full fiscal years after the river has been designated. Existing state, local, and federal laws continue in effect during the interim along with general Department of Interior guidelines. If federal designation overlaps state scenic waterway designation, a joint federal/state manage-

ment plan would be developed. All management plans will address the roles of federal, state, county, and relevant Indian tribal governments in management of the river.

For the sake of clarity, the guidelines that follow are presented for each separate river classification (recreational, scenic, and wild river areas). River classifications are further described in the Wild and Scenic Eligibility and Classification Determinations section of this appendix.

Recreational River Areas

Recreational rivers are defined by the Act to be "Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past."

Management Objective for Recreational River Areas

Management of recreational river areas should be designed to protect the existing ORVs. The primary objective will be to provide opportunities for the public to participate in recreation activities dependent on or enhanced by the largely free-flowing nature of the river.

Management Standards for Recreational River Areas

Recreation facilities may be established near the river, although recreational river classification does not require extensive recreational developments. Recreation facilities may still be kept to a minimum, with visitor services provided outside the river area. Future construction of impoundments, diversions, straightening, rip-rapping, and other modification of the waterway or adjacent lands would not be permitted except in instances where such developments would not have a direct and adverse effect on the river and its immediate environment. The following program management standards apply:

Forestry Practices. Forestry practices, including timber harvesting, would be allowed under standard restrictions to avoid adverse effects on the river environment and its associated values.

Hydroelectric Power and Water Resource Development. No development of hydroelectric power facilities would be permitted. Existing low dams, diversion works, rip rap and other minor structures may be maintained provided the waterway remains generally natural in appearance. New structures may be allowed provided that the area remains generally natural in appearance and the structures harmonize with the surrounding environment.

Mining. Subject to existing regulations, such as 43 CRF 3809, and any future regulations that the Secretary of the Interior may prescribe to protect values of rivers included in the NWSRS, new mining claims are allowed and existing operations are allowed to continue. All mineral activity on federally administered land must be conducted in a manner that minimizes surface disturbance, water sedimentation and pollution, and visual impairment. Reasonable mining claim and mineral lease access will be permitted. Mining claims within the designated area that are perfected after the effective date of river designation can be patented only as to the mineral estate and not the surface estate. A mining claim is perfected when the claimant has satisfactorily met all the requirements for patenting.

Road and Trail Construction. Existing parallel roads can be maintained on one or both river banks. There can be several bridge crossings and numerous river access points. Roads, trails, and visitor areas must conform to construction and maintenance standards and be free of recognized hazards.

Agricultural Practices and Livestock Grazing. Lands may be managed for a full range of agriculture and livestock grazing uses, consistent with current practices.

Recreation Facilities. Interpretive centers, administrative headquarters, campgrounds, and picnic areas may be established near the river; however, a recreational classification does not require extensive recreation development. Any recreation facility development should result in no more than a moderate change in the characteristic landscape and should not dominate the view of the casual observer.

Public Use and Access. Recreation use including, but not limited to, hiking, fishing, hunting, and boating is encouraged in recreational river areas to the extent consistent with the protection of the river environment. Public use and access may be regulated and distributed where necessary to protect and enhance the outstandingly remarkable values (ORVs).

Rights-of-Way. New transmission lines, natural gas lines, water lines, etc., are discouraged unless specifically prohibited outright by other plans, orders, or laws. Where no reasonable alternative location exists, additional or new facilities should be restricted to existing rights-of-way. Where new rights-of-way are unavoidable, locations and construction techniques will be selected to minimize adverse effects on ORVs and fully evaluated during the site selection process.

Motorized Travel. Motorized travel will generally be permitted on existed roads. Controls will usually be similar to that of surrounding lands. Motorized travel on water will be in accordance with existing regulations or restrictions.

Scenic River Areas

Scenic rivers are defined by the Act to be "Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads."

Management Objective for Scenic River Areas

Management of scenic river areas should give emphasis to protecting the ORVs while providing river-related outdoor recreation opportunities in a semi-primitive or near-natural setting. The basic distinctions between a *recreational* and a *scenic* river area are the degree of development, types of land use, and road accessibility. In general, a wide range of agricultural, water management, silvicultural, and other practices or structures could be compatible with ORVs, providing such practices or structures are carried on in such a way that there is no substantial adverse effect on the river and its immediate environment.

Management Standards for Scenic River Areas

Allowable management practices might include construction of minor structures for such purposes as improvement of fish and game habitat; grazing; protection from fire, insects, or disease; and rehabilitation or stabilization of damaged resources; provided the area will remain natural in appearance and the practices or structures are compatible and in harmony with the environment. Developments such as trail bridges, occasional fencing, natural-appearing water diversions, ditches, flow measurement or other water management devices, and similar facilities may be permitted if they are unobtrusive and do not have a significant direct and adverse effect on the natural character of the river area. Motorized vehicle use may, in some cases, be appropriate and development of larger scale public-use facilities within the river area, such as moderate-sized campgrounds, interpretive centers, or administrative headquarters would ber compatible if such facilities were screened from the river. The following program management standards apply:

Forestry Practices. Silvicultural practices including timber harvesting could be allowed provided that such practices are carried on in such a way that there is no substantial adverse effect on the river and its immediate environment. The river area should be maintained in its near-natural condition. Timber outside the boundary, but within the visual seen area, should be managed and harvested in a manner that provides special emphasis on visual quality. Preferably, reestablishment of tree cover would be through natural revegetation. Cutting of dead or down materials for fuelwood will be limited. Where necessary, restrictions on use of wood for fuel could be prescribed.

Hydroelectric Power and Water Resource Development. No development of hydroelectric power facilities would be permitted. Flood control dams and levees would be prohibited. All water supply dams and major diversions are prohibited. Maintenance of existing facilities and construction of some new structures would be permitted provided that the area remains natural in appearance and the practices or structures harmonize with the surrounding environment.

Mining. Subject to existing regulations, such as 43 CRF 3809, and any future regulations that the Secretary of the Interior may prescribe to protect the values of rivers included in the NWSRS, new mining claims are allowed and mineral leases can be allowed. All mineral activity on federally administered land must be conducted in a manner that minimizes surface disturbance, water sedimentation and pollution, and visual impairment. Reasonable mining claim and mineral lease access will be permitted. Mining claims within the designated area that are perfected after the effective date of scenic river designation can be patented only as to the mineral estate and not the surface estate. A mining claim is perfected when the claimant has satisfactorily met all the requirements for patenting.

Road and Trail Construction. Roads may occasionally bridge the river and short stretches of conspicuous roads or long stretches of inconspicuous and well-screened roads could be allowed. Maintenance of existing roads and any new roads or trails will be based on the type of use for which the roads are constructed and the type of use that will occur in the river area.

Agricultural Practices and Livestock Grazing. A wide range of agricultural and livestock grazing uses is permitted to the extent currently practiced. Row crops are not considered as an intrusion of the "largely primitive" nature of scenic corridors as long as there is not a substantial adverse effect on the natural-like appearance of the river area.

Recreation Facilities. Larger-scale public use facilities, such as moderate-sized campgrounds, interpretive centers, or administrative headquarters are allowed if such facilities are screened from the river. Any recreation facility development should result in no more than a minor change in the characteristic landscape and should not attract the attention of the casual observer.

Public Use and Access. Recreation use including, but not limited to, hiking, fishing, hunting, and boating is encouraged in scenic river areas to the extent consistent with the protection of the river environment. Public use and access may be regulated and distributed where necessary to protect and enhance ORVs.

Rights-of-Way. New transmission lines, natural gas lines, water lines, etc., are discouraged unless specifically prohibited outright by other plans, orders, or laws. Where no reasonable alternative exists, additional or new facilities should be restricted to existing rights-of-way. Where new rights-of-way are unavoidable, locations and construction techniques will be both selected to minimize adverse effects on ORVs and fully evaluated during the site selection process.

Motorized Travel. Motorized travel on land or water may be permitted, prohibited, or restricted to protect river values. Prescriptions for management of motorized use may allow for search and rescue and other emergency situations.

Wild River Areas

Wild rivers are defined by the Act to include "Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America." The Klamath Falls Resource Area (KFRA) contains no river segments that meet this definition.

Management Objective for Wild River Areas

Management of wild river areas should give primary emphasis to protecting the outstandingly remarkable values while providing river-related outdoor recreation opportunities in a primitive setting.

Management Standards for Wild River Areas

The same considerations set forth for scenic river areas should be considered, except that the standards would probably be more strict. For example, motorized vehicle use may not be appropriate and construction of minor structures and facilities, if allowed, would be well screened from the river. The following program management standards apply:

Forestry Practices. Cutting of trees will not be permitted except when needed in association with a primitive recreation experience, such as clearing for trails and for visitor safety or to protect the environment, such as control of fire. Timber outside the boundary, but within the visual corridors should, where feasible, be managed and harvested in a manner to provide special emphasis to visual quality.

Hydroelectric Power and Water Resource Development. No development of hydroelectric power facilities would be permitted. No new flood control dams, levees, or other works are allowed in the channel or river corridor. All water supply dams and major diversions are prohibited. The natural appearance and essentially primitive character of the river area must be maintained. Federal agency groundwater development for range, wildlife, recreation, or administrative facilities may be permitted if there are no adverse effects on ORVs.

Mining. New mining claims and mineral leases are prohibited within 1/4 mile of the river. Valid existing claims would not be nullified and, subject to existing regulations, such as 43 CFR 3809, and any future regulations that the Secretary of the Interior may prescribe to protect the rivers included in the NWSRS, existing mining activity on the existing claims would be allowed to continue. All mineral activity on federally administered land must be conducted in a manner that minimizes surface disturbance, water sedimentation, pollution, and visual impairment. Reasonable mining claim and mineral lease access will be permitted. Mining claims beyond 1/4 mile of the river, but within the wild river area boundary, that are perfected after the effective date of the wild river designation, can be patented only as to the mineral estate and not the surface estate. A mining claim is perfected when the claimant has satisfactorily met all the requirements for patenting.

Road and Trail Construction. No new roads or other provisions for overland motorized travel would be permitted within a narrow incised river valley or, if the river valley is broad, within 1/4 mile of the river bank. A

few inconspicuous roads leading to the boundary of the river area and unobtrusive trail bridges may be permitted.

Agricultural Practices and Livestock Grazing. Agricultural use is restricted to a limited amount of domestic livestock grazing and hay production to the extent practiced prior to designation. Row crops are prohibited.

Recreation Facilities. Public-use facilities, such as campgrounds, interpretive centers, or administrative headquarters are located outside wild river areas. Simple comfort and convenience facilities, such as toilets, tables, fireplaces, shelters, and refuse containers may be provided as necessary within the river area. Any recreation facility development should harmonize with the surroundings. Unobtrusive hiking and horseback riding trail bridges could be allowed on tributaries, but would not normally cross the designated river.

Public Use and Access. Recreation use including, but not limited to, hiking, fishing, hunting, and boating is encouraged in wild river areas to the extent consistent with the protection of the river environment. Public use and access may be regulated and distributed where necessary to protect and enhance ORVs.

Rights-of-Way. New transmission lines, natural gas lines, water lines, etc., are discouraged unless specifically prohibited outright by other plans, orders, or laws. Where no reasonable alternative exists, additional or new facilities should be restricted to existing rights-of-way. Where new rights-of-way are unavoidable, locations and construction techniques will be selected to minimize adverse effects on ORVs and fully evaluated during the site-selection process.

Motorized Travel. Motorized travel on land or water could be permitted, but it is generally not compatible with this river classification. Normally, motorized use will be prohibited in a wild river area. Prescriptions for management of motorized use may allow for search and rescue and other emergency situations.

Management Objectives Common To Recreational, Scenic, and Wild River Areas

Water Quality

Water quality will be maintained or improved to meet federal criteria or federally-approved state standards. River management plans shall prescribe a process for monitoring water quality on a continuing basis.

Fire Protection and Suppression

Management and suppression of fires within a designated river area will be carried out in a manner compatible with contiguous federal lands. On wildfires, suppression methods that minimize long-term impacts on the river and river area will be used. Presuppression and prevention activities will be conducted in a manner that reflects management objectives for the specific river segment. Prescribed fire may be used to maintain or restore ecological condition or meet objectives of the river plan.

Insects, Diseases, and Noxious Weeds

The control of forest and range land pests, diseases, and noxious weed infestations will be carried out in a manner compatible with the intent of the Act and management objectives of contiguous federal lands.

Cultural Resources

Historic and prehistoric resource sites will be identified, evaluated, and protected in a manner compatible with the management objectives of the river and in accordance with applicable regulations and policies. Where appropriate, historic or prehistoric sites will be stabilized, enhanced, and interpreted.

Fish and Wildlife Habitat Improvement

The construction and maintenance of minor structures for the protection, conservation, rehabilitation, or enhancement of fish and wildlife habitat are acceptable provided they do not affect the free-flowing characteristics of the river, are compatible with the classification, the area remains natural in appearance, and the practices or structures harmonize with the surrounding environment.

Recreation

The river management plan would evaluate current and potential recreational use and, if appropriate, identify a maximum carrying capacity for recreational boating use. The implementation of permit systems, other than permits for commercial use (outfitters and guides) of federal lands and related waters, is typically undertaken only when public use approaches the identified maximum carrying capacity.

Oregon Scenic Waterways Act

In 1969 the State of Oregon passed the Oregon Scenic Waterways Act. This legislation established a program to protect state designated rivers throughout Oregon and is administered by the Oregon Department of Parks and Recreation. Its goals are to protect the free-flowing character of designated rivers for fish, wildlife, and recreation. Dams, reservoirs, impoundments, and placer mining are prohibited on state scenic waterways. The Oregon Act requires review of new developments along designated rivers, but does not affect existing water rights, developments, or uses.

Management Constraints On Private Lands

Designation of a river under the National Wild and Scenic Rivers Act (NWSRA) gives the federal government no authority to regulate or zone private lands. Land use controls on private lands are solely a matter of state and local zoning regulations. Although the NWSRA includes provisions to encourage the protection of river values through state and governmental land use planning, these provisions are not binding on local governments. The federal government is responsible for assuring that designated rivers are managed in a manner which meets the intent of the Act.

River management plans may prescribe land use or development limitations to protect outstandingly remarkable river values. Many uses may be compatible with a wild, scenic, or recreational classification as long as the rivers are administered to protect and enhance the values that caused them to be included in the national system. Most existing uses and activities on adjoining private lands may continue. Timber harvest activities on private lands within a designated river boundary would continue to be regulated by the Oregon Forest Practices Act.

The primary consideration in any river or land use limitation would be the protection and enhancement of a designated river's outstandingly remarkable value(s) (ORVs). The BLM will work closely with landowners to assure that all uses will be consistent with the intent of the Act. Those uses that clearly threaten identified outstandingly remarkable values will be addressed on a case-by-case basis.

Specific management goals for construction of new buildings, other structures, or roads on private lands along designated rivers would be addressed through the individual river management plans. Federal guidelines allow different degrees of development along rivers, depending on their classification. In consultation with landowners involved, every effort would be made to reduce adverse impacts to an acceptable level on proposals for major up-grading, realignment, and/or new construction of roads. Maintenance of existing roads generally would not alter a river's condition and thus would not be restricted.

On designated rivers, the BLM could negotiate with a landowner to purchase specific development rights necessary to prevent any threat to the river's identified ORVs if all other efforts fail to reduce anticipated impacts to an acceptable level. Another option would be land exchange, where mutually agreeable, providing the private landowner with comparable lands outside the administrative boundary of a river.

The NWSRA specifically prohibits the use of condemnation in the fee title purchase of lands if 50 percent or more of the land within the boundary is already in public ownership. While the Act provides the federal government with authority to purchase scenic, conservation, or access easements through condemnation proceedings, this is considered to be a measure of last resort. In the event condemnation was considered necessary, the only landowner rights purchased would be those considered necessary to prevent the threat to the river or its ORVs.

If the BLM acquires an easement on private land, depending upon its terms and conditions, public access rights may or may not be involved. For example, a *scenic easement* could only involve the protection of narrowly defined visual qualities with no provisions for public use. A *trail or road easement* would involve public use provisions. Any provisions for public use of private lands must be specifically purchased from the landowner. The BLM would work closely with landowners to minimize public use of nonfederal lands, through brochures, maps, signs, and/or other appropriate means, except in locations where rights to such use are acquired.

River designation does not affect a private landowner's rights to control trespass. Landowners can charge a fee for crossing private lands to fish designated rivers except where a public access easement exists. The designation of a river into the National Wild and Scenic Rivers System does not change landowner rights unless all or a portion of these use rights are acquired from the landowner.

On navigable rivers, the river bed and banks to the mean high water mark are owned by the state and are available for public use under state laws. Private landowners control public access to their property

along the banks of non-navigable rivers. The designation of a river into the NWSRS has no bearing upon its determination of navigability.

Ownership and use of valid water rights are not affected by a federal river designation.

Wild and Scenic River Eligibility and Classification Determinations

Eligibility

The first step in proposing additional rivers to the National Wild and Scenic Rivers System (NWSRS) is to determine if the river is eligible. To qualify, a river must meet two criteria: (1) it must be free flowing and (2) with its immediate environment, it must have at least one outstanding remarkable value. Free-flowing, as defined in Section 16(b) of the Wild and Scenic Rivers Act, means "existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway." Free-flowing should not be confused with naturally flowing, which is flowing without any up-stream manipulation except by nature. The presence of impoundments above and below the segment (including those that regulate the flow regime through the segment) and existing minor dams and diversion structures within the study reach will not by themselves render a river ineligible. There are many river segments in the NWSRS that are downstream from major dams, such as the Rogue River in Oregon and the lower Klamath River in California, or are between dams, such as the Tuolumne River in California. Some components of the system, such as the Clackamas, Deschutes, and Snake rivers in Oregon and the Trinity River in California, even derive their recreational values, at least in part, from the operation of upstream dams. These values are stated in the National Wild and Scenic Rivers Act as "scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values". The Act did not specifically spell out the criteria to judge these values. The west side Oregon BLM districts developed criteria (written up in Instruction Memorandum OR-89-632) which, are described as follows:

A river's scenic, recreational, geologic, fish, wildlife, cultural, and/or historic value(s) are deemed "outstandingly remarkable" if one or more of the following guidelines apply to the value(s) under consideration.

Scenic. The landscape elements of landform, vegetation, water, color, influence of adjacent scenery, scarcity, and cultural modifications are unique and harmonious. The rating area must be scenic quality "A" as defined in the Visual Resource Inventory Handbook, H-8410-1. When analyzing scenic values, additional factors such as seasonal variations in vegetation, scale of cultural modifications, and length of time that negative intrusions are viewed may be considered. Scenery and visual attractions may be highly diverse over the majority of the river or river segment length and not common to other rivers in the geographic region.

Recreational. Recreational opportunities are or have the potential to be unique enough to attract visitors from outside the geographic region. Visitors would be willing to travel long distances to use the river resources for recreational purposes. River-related opportunities could include, but not be limited to, sightseeing, wildlife observation, photography, hiking, fishing, hunting, and boating. Interpretive opportunities may be exceptional and attract or have the potential to attract visitors from outside the geographic region. The river may provide or have the potential to provide settings for national or regional commercial usage or competitive events.

Geologic. The river or the area within the river corridor contains an example(s) of a geologic feature, process, or phenomena that is rare, unusual, one-of-a-kind, or unique to the geographic region. The feature(s) may be in an unusually active state of development, represent a "textbook" example and/or represent a unique or rare combination of geologic features (such as erosional, volcanic, glacial, or other geologic structures).

Fish. Fish values may be judged on the relative merits of either fish populations or habitat - or a combination of these river-related conditions:

> **Populations.** The river is nationally or regionally one of the top producers of resident and/or anadromous fish species. Of particular significance is the presence of wild or unique stocks, or populations of federally listed or candidate threatened or endangered species.
>
> **Habitat.** The river provides exceptionally high quality habitat for fish species indigenous to the region. Of particular significance is habitat for federally listed or candidate threatened or endangered species.

Wildlife. Wildlife values may be judged on the relative merits of either wildlife populations or habitat - or a combination of these conditions:

> **Populations.** The river or river area within the river corridor contains nationally or regionally important populations of indigenous wildlife species dependent on the river environment. Of particular significance are species consid-

ered to be unique or populations of federally listed or candidate threatened or endangered species which are dependent on the river environment.

Habitat. The river or area within the river corridor provides a principal food source, unique habitation site, or migration route for wildlife of national or regional significance, or for a federally listed or candidate threatened or endangered species. Contiguous habitat conditions are such that the biological need of the species are met.

Cultural. The river or area within the river corridor contains a site(s) where there is evidence of occupation or use by Native Americans. Sites must be rare, one-of-a-kind, have unusual characteristics or exceptional human interest value(s). Sites may have national or regional importance for interpreting prehistory; may be rare and represent an area where a culture or cultural period was first identified and described; may have been used concurrently by two or more cultural groups; or may have been used by cultural groups for rare or sacred purposes.

Historic. The river or area within the river corridor contains a sites(s) or feature(s) associated with a significant event, an important person, or a cultural activity of the past that was rare, unusual, or one-of-a-kind in the region. A historic site(s) and/or feature(s) in most cases is 50 years old or older. Of particular significance are sites or features listed in, or are eligible for inclusion in, the National Register of Historic Places.

Other Similar Values. While no specific evaluation guidelines have been developed for the other similar values category, it is assumed that additional river-related values not covered in this attachment will be assessed in a manner consistent with the foregoing guidance including, but not limited to, hydrologic, ecologic/biologic diversity, paleontologic, botanic, and scientific study opportunities.

Classification

After determining a river's eligibility for inclusion in the National Wild and Scenic River System, it must be classified according to the category - wild, scenic, or recreational - that best fits each eligible segment. These terms can be misleading - a *scenic* river may have been designated for reasons other than scenery, and a *recreational* river doesn't necessarily have outstandingly remarkable recreational resources. Classification is based on the degree of naturalness and extent of development of the river and its adjacent lands as they exist at the time of the study.

Classifying a study river as wild, scenic, or recreational implies a level of interim protective management for federal lands in the study area until a decision on designations is made by the Congress. If the Congress designates a river or river segment, it will be managed according to how it is classified (a river segment can be classified at or below the highest level for which it qualifies). Specific management strategies may vary according to classification, but would be designed to protect and enhance the outstandingly remarkable values of the river area. These specific management strategies are formulated during development of the management plan, required within three full fiscal years of designation (section 3(d) (1) of the National Wild and Scenic Rivers Act).

The three classification categories for eligible rivers are defined in section 2(b) of the NWSRA as:

Wild River Areas. Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

Scenic River Areas. Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Recreational River Areas. Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

A wild river would be a very undeveloped river with limited access. A scenic classification would be applied to a river or river segment that is more developed than a wild river and less developed than a recreational river. A recreational classification would be appropriate in developed areas, such as where a river runs parallel to roads or railroads with adjacent lands that have agricultural, forestry, commercial, or other developments, provided that the waterway remains generally natural and riverine in appearance.

The Federal Register, volume 47, number 174, September 7, 1982, gives guidance for classifying rivers. Water quality, water resources development, shoreline development, and accessibility are the criteria to be considered when determining classification. Each

criterion is important, but their collective intent is more important. Although each classification permits existing development, the criteria do not imply that additional inconsistent development is permitted in the future.

Developments that are compatible with designation would be allowed, provided they are carried out in an environmentally sound manner. Table 2-E-1 further defines the four criteria.

Table 2-E-1: Classification Criteria for Wild, Scenic, and Recreational River Areas

Attribute	Wild	Scenic	Recreational
Water Resources Development	Free of impoundment.	Free of impoundment.	Some existing impoundments or diversion. The existence of low diversions or other modifications of the waterway is acceptable, provided the waterway remains generally natural and riverine in appearance.
Shoreline Development	Essentially primitive. Little or no evidence of human activity.	Largely primitive and undeveloped. No substantial evidence of human activity.	Some development. Substantial evidence of human activity.
	The presence of a few inconspicuous structures, particularly those of historic or cultural values, is acceptable.	The presence of small communities or dispersed dwellings or farm structures is acceptable.	The presence of extensive residential development and a few commercial structures is acceptable.
	A limited amount of domestic livestock grazing or hay production is acceptable.	The presence of grazing, hay production, or row crops is acceptable.	Lands may have been developed for the full range of agricultural and forestry uses.
	Little or no evidence of past timber harvest. No ongoing timber harvest.	Evidence of past or ongoing timber harvest is acceptable, provided the forest appears natural from the riverbank.	May show evidence of past and ongoing timber harvest.
Water Quality	Meets or exceeds federal criteria or federally approved state standards for aesthetics, for propagation of fish and wildlife normally adapted to the habitat of the river, and for primary contact recreation (swimming) except where exceeded by natural conditions.	No criteria prescribed the Wild and Scenic Rivers Act. The Federal Water Pollution Control Act Amendments of 1972 have made it a national goal that all waters of the United States be made fishable and swimmable. Therefore, rivers will not be precluded from scenic or recreational classification because of poor water quality at the time of their study, provided a water quality improvement plan exists or is being developed in compliance with applicable federal and state laws.	
Accessibility	Generally inaccessible except by trail. No roads, railroads, or other provisions for vehicular travel within the river area. A few existing roads leading to the boundary of the river area is acceptable.	Accessible in places by road. Roads may occasionally reach or bridge the river. The existence of short stretches of conspicuous or longer stretches of inconspicuous roads or railroads is acceptable.	Readily accessible by road or railroad. The existence of parallel roads or railroads on one or both banks as well as bridge crossing and other river access points is acceptable.

Source: The Federal Register, Volume 47, Number 174, September 7, 1982.

Wild and Scenic River Suitability Assessments

Introduction

This appendix contains suitability assessments for all six river segments found eligible for inclusion in the National Wild and Scenic Rivers System (NWSRS). These river segments that were found eligible as part of this planning process are segments A and C of Antelope Creek, Barnes Valley Creek, Spencer Creek, Miller Creek, and segment 2 of the upper Klamath River. All eligible river segments are within state comprehensive outdoor recreation plan (SCORP) region 9 (see map 2-E-1). Map 3-10 shows the location of these river segments in the planning area.

Only five suitability assessments are included in this appendix because segments A and C of Antelope Creek are located in the same general area and contain similar values so they were combined into one assessment. Segment 3 of the upper Klamath River, which begins where segment 2 ends, was determined suitable through the Redding (California) BLM Draft Resource Management Plan (March 1991). The resource values in both segments are similar and would most appropriately be managed together, therefore, the proposed action for segment 3 from the Redding RMP is included at the end of this appendix for the reader's information and for comparison with management alternatives for segment 2.

This introduction to the individual suitability assessments, in addition to general background material, contains suitability criteria, information on potential land acquisition, public involvement, a comparison of outstandingly remarkable values (ORVs) for each designated and eligible study river in the SCORP region, and the formula used to determine the theoretic hydroelectric power potential of each eligible river segment.

The analysis of a river's potential for designation under the National Wild and Scenic Rivers Act (NWSRA) involves three separate steps: determining eligibility, establishing classification, and finding of suitability.

The eligibility and classification criteria are described in the previous section of this appendix, called Wild and Scenic River Eligibility and Classification Determinations. To be eligible for designation a river or river segment must be free-flowing and possess at least one outstandingly remarkable value. During the RMP/EIS planning process, ten stream segments were reviewed for determination of eligibility; four were found ineligible (Rock Creek, segment B of Antelope Creek, segment 1 of the upper Klamath River, and East Branch of the Lost River). The eligibility determinations are on file at the Klamath Falls Resource Area office.

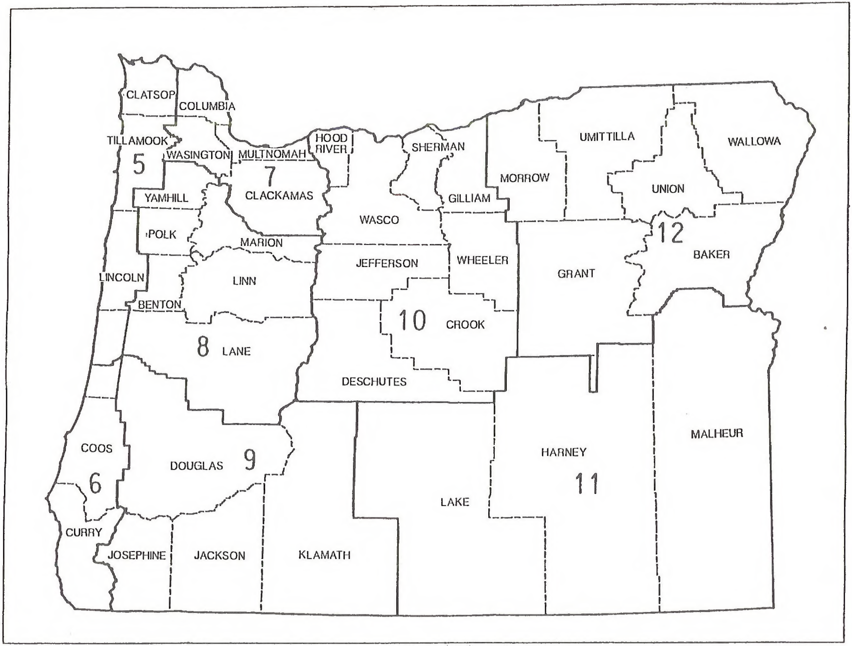
For each river segment determined to be eligible, a tentative classification of wild, scenic, or recreational must be established. River area classification is based on the level and extent of development of and accessibility to the river segment at the time of the study. A summary of eligibility and highest potential classification is shown in chapter 3, table 3-23.

For each eligible river segment, a finding must be made as to whether it would make a suitable addition to the National Wild and Scenic Rivers System. Suitability findings by alternative are shown in chapter 2, table 2-15. Criteria specified in section 4(a) of the Wild and Scenic Rivers Act provides a basis for suitability assessment. These criteria are as follows:

- The characteristics that do or do not make the area a worthy addition to the system;
- The current status of land ownership and use in the area;
- The reasonably foreseeable potential uses of the land and water which would be enhanced, foreclosed, or curtailed if the area were included in the NWSRS;
- The federal agency that should administer the river;
- The extent to which the costs thereof would be shared by state and local agencies; and
- The estimated cost to the United States of acquiring necessary land and interest in land and of administering the area, should it be added to the system.

The Summary of the Analysis of the Management Situation (BLM 1990) stated that a separate legislative environmental impact statement (LEIS) would be prepared for rivers or river segments found suitable for designation as a component of the NWSRS. The LEIS would have been the method of forwarding the findings and recommendations to the Congress. However, it has been subsequently decided that this RMP/EIS will serve as the only document analyzing environmental impacts of the findings of suitability or nonsuitability for the assessed river segments. Final designation decisions are made by the Congress.

For all river segments found eligible, except for segment 2 of the upper Klamath River, all BLM-administered land within one-quarter mile on either side of the river segments will be afforded a level of interim management necessary for protection of identified outstanding remarkable values. All BLM-administered



SCORP Geographic Regions for Oregon.

land from rim-to-rim along segment 2 of the upper Klamath River would be protected under such interim management. This interim management will continue until a determination of nonsuitability is made through the RMP or a final decision on designation is made by the Congress.

The federal government does not manage private land within designated wild, scenic, or recreational river areas and has no zoning authority over these lands under the Act. The federal government's authority to affect private lands is primarily through the acquisition authorities conferred in the NWSRA. Except for the acquisition of land or interest in lands, for which just compensation is made, the agencies cannot regulate the use of private property via this law. Section 6(b) of the Act prohibits federal condemnation to purchase fee title lands when 50 percent or more of a designated river corridor is public land (federal, state, county, etc.). However, section 6(b) does allow the use of condemnation to purchase scenic easements as a measure of last resort to remove or prevent a threat to the river or its ORVs.

Private land ownership is legitimate within designated river boundaries, and existing private land uses are often consistent with management goals of wild, scenic, or recreational river areas. Carefully conducted ranching, farming, mining, and forest management activities within scenic and recreational river areas may continue. Assistance to private landowners may be provided by the federal government to encourage practices that enhance the river's natural values, for example, water quality and quantity, streambank stability, and riparian habitat.

There has been minimal public comment regarding the suitability of all eligible rivers except for the upper Klamath River. The strongest feelings against designation of the Klamath River into the NWSRS were in letters from Klamath Falls, while the strongest feelings for designation were in letters from California and other states not including Oregon. In Oregon (excluding Klamath Falls), the sentiment was fairly evenly divided, but leaned slightly more toward designation. A hydroelectric project has been proposed by the City of Klamath Falls on segment 2 of the upper Klamath River. The controversy centers around construction of the hydroelectric project vs designation under the Act. Public responses are on file at the Klamath Falls Resource Area office.

Based on planning criteria in the State Director's guidance for formulation of planning alternatives (see appendix 1-F), the BLM made a comparison of ORVs associated with each eligible river segment in each SCORP region. Rivers were found suitable for designation in the NWSRS in the different alternatives based on whether one or more of its ORVs were ranked among the top four (alternative D), top two (alternative C), or top one (alternative B) river(s) in its SCORP region. Rivers that are already included in the NWSRS were ranked equally as being among the top river(s) in the SCORP region.

Table 2-E-2. Ranking of Outstanding Remarkable Values in SCORP Region 9.

River Segment	R[1]	F	G	W	S	P	H	O
Rogue[2]	X		X	X	X		X	
N. Umpqua[2]	X		X		X			X
Upper Rogue[2]		X		X	X			
Upper Klamath[3], segment 2	X		X	X	X	X	X	X
Illinois	X		X		X			X
Whiskey Creek (to E. and N. forks)							X	
Antelope Creek, segments A and C						X		

[1]Abbreviations used in this table:
R = Recreational G = Geological F = Fish W = Wildlife S = Scenic P = Prehistoric H = Historical
O = Other (such as water quality, hydrological, botanical, vegetation, ecological, biological, and diversity)
[2]River segments previously designated.
[3]Segment 2 of the upper Klamath River ranks in the top 1 or 2 rivers for prehistoric, historic, and other ORVs.

Four designated rivers (the Rogue, upper Rogue, Illinois, and North Umpqua) and one Congressionally-mandated study river (the upper Klamath) flow through SCORP region 9. Therefore, the ORVs associated with those rivers were ranked above those on non-designated rivers. The top four river areas per ORV are shown in table 2-E-2, with the top river(s) listed first. The only segments being studied through this planning process posessing ORVs that rank in the top four for SCORP region 9 are Whiskey and Antelope creeks with prehistoric values. Both the eligibility and suitability determinations were coordinated with all appropriate BLM districts and national forests in the SCORP region.

One indicator of the suitability of a river is its hydroelectric water diversion potential. This potential was determined using the Oregon State University's Water Resources Research Institute's 1979 study entitled, *A Resource Survey of Low-Head Hydroelectric Power Potential in Oregon.* According to that study, the gross theoretical potential hydroelectric power available in any stream reach is determined by the formula: P = cQHe where:

P = power (kilowatts)
c = conversion factor = 0.08475
Q = streamflow (cubic feet per second, cfs)
H = head (feet)
e = efficiency = 1.0

Streamflow was determined at the midpoint of the study segment based on available streamflow records and/or from established drainage basin runoff. Head was determined as the total fall in the entire length of the study segment.

Streamflow has to be at least 35 cfs for a reach to be considered to have hydroelectric power potential. In the 1979 study, a stream reach had to have a power potential of 200 kilowatts (kW) at a maximum head of 66 feet, which would correspond to an average annual streamflow of approximately 35 cfs to be included in the study. A common cutoff for BLM waterpower withdrawal review and hydroelectric site evaluations has been 1500 kW at average annual flow, with no head limit. Using an annual average flow of 35 cfs, it would require a head of 500 feet to develop 1500 kW. An annual average flow of 35 cfs is the equivalent of a power output of about 3 kW per foot of head in the study segment. Using 3 kW per foot as a minimum limit, an annual average flow of 35 cfs or more is necessary in the study segment to warrant consideration for hydroelectric power potential in this analysis (Ken St. Mary, OSO Water Power staff, Informal Memorandum February 13, 1992).

This formula and assumption were used for all river segments included in this appendix; therefore, they will not be repeated in each assessment.

Each of the following five suitability assessments contains a summary that identifies the location and finding of the river segment(s) followed by a more detailed description of the river corridor and other factors considered in the suitability determination. For purposes of analysis, all the river segments were found suitable under one or more alternatives and not suitable under the remaining alternatives. The following assessments analyze management of the resources in the river corridor under both scenarios (suitable and not suitable). The suitability finding for each river assessment corresponds to the management action for that river segment(s) described under the Preferred alternative in chapter 2.

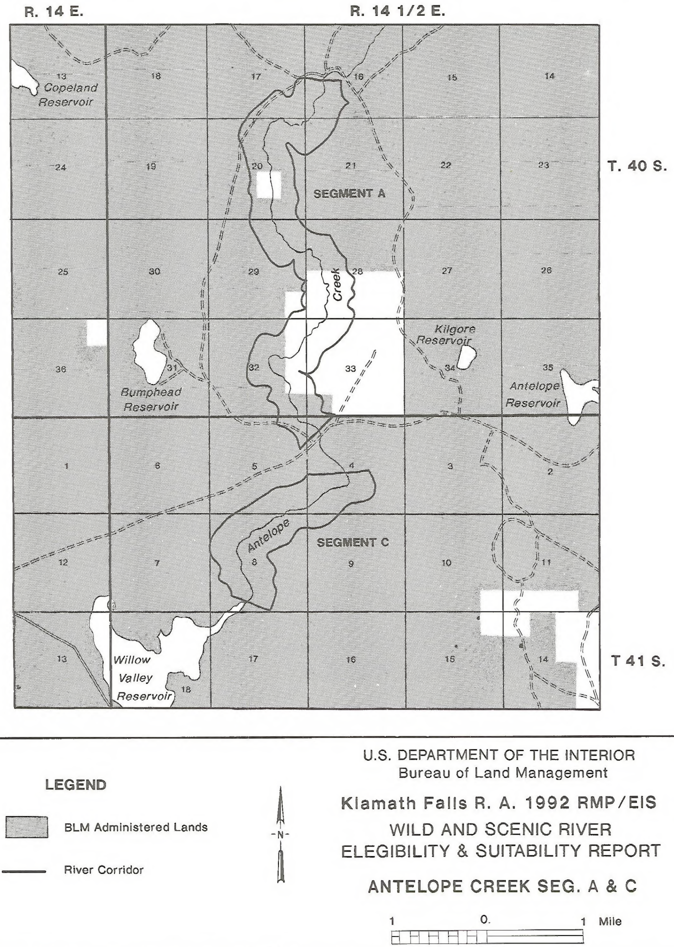
Antelope Creek

Summary

The 5.4-mile (segment A) and 2.7-mile (segment C) segments of Antelope Creek, which are on the east side of the resource area south of Gerber Reservoir, are found **not suitable** for designation under the National Wild and Scenic Rivers Act. Segment A runs from the North Spring access road to the bridge on the CCC road. Segment C runs from Duncan Spring to the backwater of Willow Valley Reservoir. Segment B, which runs between segments A and C, was previously found ineligible. The BLM has 75 percent administrative jurisdiction along segment A and 100 percent along segment C.

Background

Description of the River. The Klamath Falls Resource Area identified as eligible two segments of Antelope Creek. A third segment was found ineligible. Segment A, 5.4 miles, runs from the North Spring access road in section 16, T. 40 S., R. 14 1/2 E. to the bridge on the CCC road in section 4, T. 41 S., R. 14 1/2 E.. Segment C, 2.7 miles, runs from Duncan Spring in sections 4, T. 41 S., R. 14 1/2 E. to the backwater of Willow Valley Reservoir in section 8, T. 41 S., R. 14 1/2 E. (see map 2-E-2). Antelope Creek begins at North Spring, flows through Antelope Flat (a privately-owned irrigated pasture), and finally into Willow Valley Reservoir. A few unnamed tributaries feed into Antelope Creek. Water flow in segment C is perennial due to water from Duncan Spring, while segment A is generally intermittent. Antelope Creek provides an important water



U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management

Klamath Falls R. A. 1992 RMP/EIS

WILD AND SCENIC RIVER
ELEGIBILITY & SUITABILITY REPORT

ANTELOPE CREEK SEG. A & C

source for big game, upland gamebirds, and waterfowl, especially the perennial flow of segment C in drought years. Segment C serves as habitat for redband trout, a federal candidate category 2 species. Around 1980, the creek was stocked with Lahontan cutthroat trout (also a federal candidate category 2 species). None of these trout were found during a BLM survey in 1990; however, it was a small sampling, so the current status of the trout populations is unknown.

Ponderosa pine and aspen are found near Duncan Spring, mostly confined to the riparian zone. Juniper, as well as various shrubs, forbs, and grasses are present in the river corridor.

No existing or potential BLM recreation sites are found along the creek. The Bumpheads potential special area lies just west of the segment A boundary. Willow Valley Reservoir, just downstream of the study boundary, is fished by local anglers. Hunting, sightseeing, off-road vehicle use, and trapping also occur in the area. Recreation opportunities are chiefly enjoyed by local users. The corridor is inventoried as visual resource management (VRM) Class IV (see the Visual Resources section of Management Direction Common to All Alternatives in chapter 2 for VRM Class objectives).

Eligibility Determination. To be eligible for inclusion in the National Wild and scenic Rivers System, a river or river segment must be free-flowing and must posess at least one outstandingly remarkable value (ORV). The definition of free-flowing and guidelines for what makes a resource outstandingly remarkable can be found in the Wild and Scenic River Eligibility and Classification Determinations section of this appendix. Segments A and C of Antelope Creek are free-flowing. Segment B is not free-flowing because it has been ditched and channeled, causing major modification of the waterway. The creek's ORV is its prehistoric resources. Segment A has 19 prehistoric sites within the corridor. These include one of the largest village sites found in this upland area, as well as two petroglyph locations, rock cairns (rocks stacked on top of each other to make a pillar-like pile that are usually found on edges of rims), a hunting blind, nine lithic scatters (surface concentrations of the waste flakes from the use and manufacture of stone tools), and four other village sites. Compared to other drainages in the area, this concentration of sites is second only to those in the segment C corridor. Segment C has 38 prehistoric sites within the study area. These include 13 village sites, 20 lithic scatters, 3 petroglyph panels, a rock shelter, and a hunting blind. One of the village sites has been test excavated and has the potential for listing on the National Register of Historic Places. Segment C has the greatest concentration of prehistoric sites within such a short section of a drainage in this upland area.

The presence of redband trout (a federal candidate category 2 species) is significant, but not outstandingly remarkable. Because of the intermittant nature of stream flows in this region, few creeks maintain native populations of trout.

Classification Determination. Classification is based on the degree of naturalness and extent of development of the river and its adjacent lands, as they exist at the time of the study, using four criteria: water quality, water resources development, shoreline development, and accessibility. A description of the criteria can be found in the Wild and Scenic River Eligibility and Classification Determinations section of this appendix. Antelope Creek's highest potential classification is scenic, as shown in table 2-E-3. Water quality in segment C is generally good. Water quality in segment A has not been measured. Because the ORV in both segments A and C is prehistoric resources, the water quality neither supports nor diminishes those values. Water quality in rivers classified as a scenic (such as Antelope Creek) or recreational river area is not required to continually meet or exceed federally approved state standards; therefore, current water quality does not affect its qualifications for inclusion in the National Wild and Scenic Rivers System.

Antelope Creek's eligible segments are free of any major impoundments, diversions, or other modifications of the waterway. Segment A has some minor irrigation diversions.

There are no substantial shoreline developments, such as farm structures, dwellings, row crops, or evidence of timber harvest. The study segments flow through three livestock grazing allotments (Willow Valley [#890], Horse Camp Rim [#886], and Bumpheads [#877]). A riparian exclosure follows the creek in segment C, averaging a few hundred feet from the water, keeping livestock away from the riparian zone. No timber harvest has occurred in the past 10 years and none is expected in the next 10 years.

Although several unimproved dirt roads are in the general area, the CCC road, an improved dirt road, is the main access to Antelope Creek. The roads in the area are commonly used by local ranchers, as well as for hunting, fishing, trapping, sightseeing, and firewood cutting. The CCC road reaches the creek just outside the northern boundary of segment A. The CCC road enters the segment A corridor twice, once for approximately 0.4 miles in section 17 (T. 40 S., R. 14 1/2 E.) and again for approximately 0.4 miles in the southern part of the corridor in section 5 (T. 41 S., R. 14 1/2 E.), where it dead ends into another road. This road crosses the creek, forming the southern boundary of segment A. The roads in the corridor are visible, but are inconspicuous from the creek. Only one road

Table 2-E-3. Potential Classification Summary for Antelope Creek[1].

Activity	Wild	Scenic	Recreational
Water Quality	[2]	M/M	M/M
Water Resources Development	M/M	M/M	M/M
Shoreline Development	DM/DM	M/M	M/M
Accessibility	DM/M	M/M	M/M

[1]Summary is shown for segment A/segment C
[2]Water quality has not been measured, so it is not known if it meets or exceeds federal criteria or federally approved state standards.

Abbreviations used in this table:
M = Meets
DM = Does not meet

enters segment C, a jeep trail in section 8, T. 41 S., R. 14 1/2 E., that stops approximately 200 feet from the creek.

Suitability Factors

Current Land Status and Use. The Klamath Falls Resource Area administers approximately 6.8 stream frontage miles (4.1 miles in segment A and 2.7 miles in segment C on both sides of the creek) which is 75 percent of segment A and 100 percent of segment C, as shown in table 2-E-4. The acreage figures used in the table are approximate.

The major land use within the one-half mile river corridor is livestock grazing. As mentioned previously, Antelope Creek flows through three allotments (Willow Valley, Horse Camp Rim, and Bumpheads). Segment C has a fenced exclosure along its length that keeps livestock from grazing in the riparian zone. Where grazing is allowed, the general season of use is mid-May to mid-July. Because the grazing system used in this area is a rest rotation system, the livestock graze in the area for four to six weeks per year, or less. The large area of private land near the middle of segment A is a managed pasture. No timber harvest has occurred in the area in the past 10 years and none is expected in the next 10 years.

There are no residential developments or other structures within the corridor. The private land is zoned for forestry/range.

There are no known mining claims located within the river corridor and no federal mineral leases are in effect.

Reasonable Foreseeable Uses of the Land and Water That Would be Affected By Designation. Management guidelines and standards for land uses and management practices appropriate for river areas designated under the National Wild and Scenic Rivers Act are described in the first section of this appendix, called Management Guidelines and Standards for National Wild and Scenic Rivers. Although this assessment has found Antelope Creek not suitable, it was found to be suitable under alternative E for purposes of analysis.

Designation as a scenic river area would lead to VRM Class II management of BLM-administered land in the 1/2-mile river corridor, ensuring its scenic value would remain at the current level. This could result in enhanced recreation experiences, such as driving for pleasure, picnicking, wildlife observation, nature photography, hunting, and fishing.

Designation would preclude major diversions, hydroelectric power facilities, water supply or flood control dams, or other major streambank modifications along the creek. No other management activities that could affect the prehistoric values would be allowed on BLM-administered land.

Table 2-E-4. Segment Ownership and Status Within the Antelope Creek Corridor.

	Segment A		Segment C	
Ownership	Acres	Precent	Acres	Percent
BLM Public Domain	1,310	75	860	100
Private	1,420	25	0	0
TOTAL	**1,730**	**100**	**860**	**100**

Grazing and agricultural use could remain at existing levels, but could not be increased if it would affect the free-flowing nature of the creek or the prehistoric values in the corridor.

Hydroelectric and Other Water Diversion Potential. The potential hydroelectric power available in this stream reach has been determined using information in a 1979 study by the Oregon State University's Water Resources Research Institute (see Introduction of this section of this appendix [Wild and Scenic River Suitability Assessments]). A drainage basin that is approximately 12 square miles and an estimated potential annual average runoff of 0.20 cfs per square mile (very rough approximation from U.S. Geological Survey stream flow records on nearby streams) yields a streamflow of 2.4 cfs (12 square miles x 0.20 cfs per square mile), which is significantly below the estimated minimum flow requirements needed for hydroelectric power development (35 cfs). No Federal Energy Regulatory Commission applications or other proposals for dams or diversions are on file for this river segment.

Effects on Outstandingly Remarkable Values. With increased management attention on Antelope Creek as a result of designation, the prehistoric sites could be protected and enhanced. Water quality would have to be maintained or improved, which would positively affect the redband trout population. Along with designation usually comes increased use of the area, which could actually result in adverse impacts, such as vandalism or other damage to the prehistoric sites in the corridor.

The prehistoric values would not necessarily be diminished if Antelope Creek were not designated, but they also would not be highlighted for special management and protection.

How the River Segments Would Be Managed if They Were Not Designated or if Designated at a Lower Classification. Segments A and C of Antelope Creek would be managed with standard riparian management area buffers to protect the riparian area. This would probably provide adequate protection to the redband trout, as well as providing protection to the prehistoric sites within the riparian area. Land outside the riparian buffer would be managed under VRM Class IV standards. Management of the prehistoric resources in the area could be accomplished by nominating the area to the National Register of Historic Places and preparation of a coordinated resource management plan, which would involve affected parties (such as the Klamath and Modoc tribes).

Grazing in the corridor would change slightly under the preferred alternative compared to current management. The level of use (AUMs) would slightly decrease (from 1,220 to 1,000 AUMs) and the season of use would be slightly modified also (see appendix 2-H for specific changes for each allotment). If the creek was modified for increased irrigation use, it could affect the free-flowing character of the creek, but would not necessarily affect the ORV.

If the river were designated as recreational rather than scenic, BLM management would be similar in most respects to management without designation, but administrative costs would be higher.

Cost of Administration. The basic objective of wild and scenic river designation is to maintain the river's existing condition. If a land use or development clearly threatens the ORV which resulted in the river's designation, efforts would be made to remove the threat through local zoning, land exchanges, purchases from willing sellers, and other actions short of condemnation. In the event condemnation becomes necessary, the only landowner rights which will be purchased are those necessary to remove the threat to the specific ORV, in this case, prehistoric value. Any actual or potential threat to an ORV, together with specific options to remove or mitigate that threat, can only be determined on a case-by-case basis. Because of variable river values, possible threats, and protection mechanisms, estimated costs of acquiring necessary lands or interests in lands will be made in the river management plan required to be completed within three full fiscal years of designation.

The estimated cost of preparing a required river management plan for this stream segment would be approximately $40,000. Annual river management, administration, and monitoring costs are estimated to be less than $5,000. Cost estimates for resource protection measures would be determined through the river management planning process.

No state or local agency has come forward and stated that they would be willing to share in the administration costs on this river segment should it become part of the system. In light of the financial constraints imposed by Oregon ballot Measure 5, it is unlikely that state or local agencies would share in these costs.

Administering Agency. If Antelope Creek were added to the National Wild and Scenic Rivers System, the BLM would continue to manage the land and resources it currently administers.

Finding and Rationale

Finding. Segment A (the 5.4-mile segment from the North Spring access road to the bridge on the CCC road) and segment C (the 2.7-mile segment from Duncan Spring to the backwater of Willow Valley Reservoir) of Antelope Creek are found **unsuitable** for federal designation as a scenic river area under the National Wild and Scenic Rivers Act.

Characteristics Which Do or Do Not Make the Area a Worthy Addition to the System. Although the density of prehistoric sites along segments A and C are greater than other drainages in this upland area, that is not enough in itself to render Antelope Creek as a worthy addition to a national river system. Designation would highlight the area for special managment and protection of the sites; however, it could also adversely affect the outstandingly remarkable prehistoric values by increased vandalism that would probably result from the increased visitation that commonly occurs after a designation such as this. The existence of the federal candidate category 2 species of redband trout adds to the value of this creek, but not enough for federal designation.

The prehistoric ORV is not threatened by dam construction, irrigation development, or private construction; therefore, the BLM believes its Preferred alternative management actions would adequately protect the creek and its resources.

Barnes Valley Creek

Summary

The 5.6-mile segment of Barnes Valley Creek from the BLM/U.S. Forest Service boundary westward to the ford on the CCC road, just east of Gerber Reservoir, is found **not suitable** for designation under the National Wild and Scenic Rivers Act. The BLM has 93 percent administrative jurisdiction along Barnes Valley Creek.

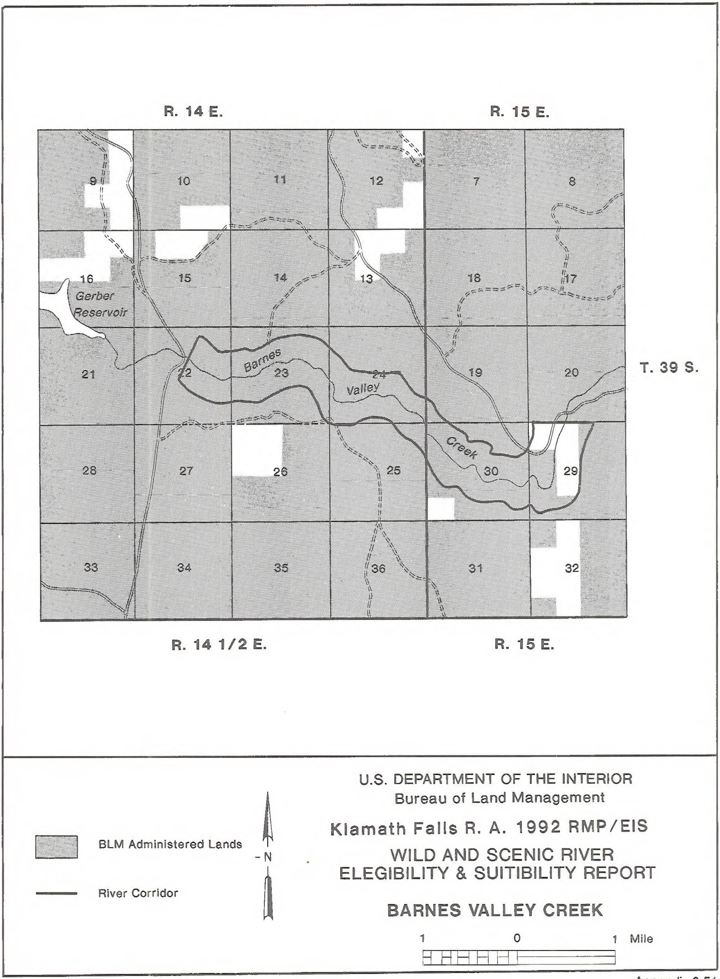
Background

Description of the River. The Klamath Falls Resource Area identified as eligible a 5.6-mile segment of Barnes Valley Creek from the BLM/U.S. Forest Service boundary (section 29, T. 39 S., R. 15 E.) to the ford on the CCC road (section 22, T. 39 S., R. 14 E.) (see map 2-E-3). Long Branch and Pitchlog creeks feed into Barnes Valley Creek, which flows into Gerber Reservoir. The western portion of Barnes Valley Creek near Gerber Reservoir has a small perennial flow. Long Branch and Pitchlog creeks have intermittent flows, as does the eastern portion of Barnes Valley Creek; however, Barnes Valley Creek provides habitat for introduced trout and Klamath largescale sucker (federal candidate category 2 species). It also provides potential habitat for the endangered Lost River and shortnose suckers and potential spawning habitat for the introduced trout and all three species of suckers. It serves as a water source for big game and waterfowl. A historically active golden eagle nest, which has not yet been checked for its status in 1992, exists within the river corridor and a bald eagle nest lies west of the corridor.

Barnes Valley Creek flows through a steep-walled, basalt canyon with diverse vegetation. Large, multi-storied old growth ponderosa pine and juniper are the dominant overstory species. Shrubs, forbs, and grasses are present throughout the corridor, with higher densities and diversity near springs and on the west end of the corridor near Gerber Reservoir. The riparian zone along Barnes Valley Creek is narrow and is characterized by wide, rocky, gravel bars and unstable side slopes.

Opportunities for isolated recreation activities exist along Barnes Valley Creek as no developed recreation sites are found in the corridor. Gerber Reservoir has opportunities for fishing, camping, hunting, sightseeing, off-road vehicle use, and driving for pleasure. A boat access lies just downstream from the western boundary of the studied river segment. Although boating is primarily limited to the reservoir, fishing on Barnes Valley Creek occurs primarily on the portion that is flooded by the reservoir and accessible by boat. Excellent opportunities exist along the creek for solitude and for semi-primitive recreation experiences (see appendix 2-D). A rock art site, which is unique in the area, as well as large campsites with stone rings are in the corridor. The potential exists to develop an interpretive trail for hiking, horseback riding, and wildlife viewing.

Eligibility Determination. To be eligible for inclusion in the National Wild and Scenic Rivers System, a river or river segment must be free-flowing and must posses at least one outstandingly remarkable value (ORV). The definition of free-flowing and guidelines for what makes a resource outstandingly remarkable can be found in the Wild and Scenic River Eligibility and Classification Determinations section of this appendix. Barnes Valley Creek is free-flowing within the study segment. The steep basalt cliffs forming the canyon walls that the creek flows through contrasts with the bench areas to provide both vegetative and geologic diversity, resulting in an outstandingly remarkable scenic value. Large, multi-storied old growth ponderosa pine stands are found on both sides of the creek. Cooler, denser stands are found on the south


R. 14 E.
R. 15 E.
9
10
11
12
7
8
16
15
14
13
18
17
Gerber Reservoir
21
22
Barnes
23
24
Valley
19
20
T. 39 S.
Creek
28
27
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R. 14 1/2 E.
R. 15 E.
BLM Administered Lands
River Corridor
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Bureau of Land Management
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ELEGIBILITY & SUITIBILITY REPORT
BARNES VALLEY CREEK
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side, in contrast to the drier, more open north side. Water flows through the west portion of the creek (near Gerber Reservoir) year-round. The BLM's 1989 Visual Resource Inventory categorized the area as Scenic Quality A (the highest classification), and as visual resource management (VRM) Class II on the western portion of the corridor and VRM Class IV on the eastern portion of the corridor (see the Visual Resources section of Management Direction Common to All Alternatives in chapter 2 for VRM Class objectives).

Barnes Valley Creek has significant, but not outstandingly remarkable fish and wildlife values. It provides habitat for introduced trout and Klamath largescale suckers, a federal candidate category 2 species; potential habitat for the endangered Lost River and shortnose suckers; and potential spawning habitat for the introduced trout and all three species of suckers. Barnes Valley Creek is used by big game and waterfowl as a water source. A historically active golden eagle nest exists within the river corridor and an active bald eagle nest lies just west of the corridor near the creek.

Another significant, although not outstandingly remarkable, value is recreation. Excellent opportunities exist for solitude, semi-primitive recreation experiences in the river corridor. Potential exists for development of additional recreation opportunities, which would decrease the level of solitude currently available.

Classification Determination. Classification is based on the degree of naturalness and extent of development of the river and its adjacent lands, as they exist at the time of the study, using four criteria: water quality, water resources development, shoreline development, and accessibility. A description of the criteria can be found in the Wild and Scenic River Eligibility and Classification Determinations section of this appendix. Barnes Valley Creek's highest potential classification is scenic, as shown in table 2-E-5. The *Oregon Statewide Assessment of Nonpoint Sources of Water Pollution* (DEQ 1988) identified the following water quality concerns in Barnes Valley Creek: severe turbidity; low dissolved oxygen; excessive nutrients; streambank erosion; decreased streamflow; insufficient stream structure; and moderate sedimentation problems impacting warm water fisheries, other aquatic life, wildlife, and aesthetics. The water quality is affected by management activities both on BLM-administered land in the corridor and upstream on the Fremont National Forest and private lands. Water quality in rivers classified as a scenic or recreational river area is not required to continually meet or exceed federally approved state standards; therefore, current water quality does not affect its qualifications for inclusion in the National Wild and Scenic Rivers System (NWSRS).

Barnes Valley Creek is free of any major impoundments, diversions, or other modifications of the waterway. A concrete road crossing (ford) marks the western boundary of the study corridor.

There are no obvious shoreline developments, such as farm structures, dwellings, or row crops. The study segment flows through two livestock grazing allotments (Pitchlog [#887] and Horsefly [#882]). The western portion of the corridor (west of the west half of section 24, T. 39 S., R. 14 E.) is generally within a fenced riparian pasture exclosure. This pasture is flash-grazed (approximately 200 cattle graze the pasture for only five days per year). The eastern portion of the corridor is also within a fenced riparian pasture that is grazed for approximately two to four weeks per year. Timber in the western portion of the corridor was cut (using a partial cut prescription) fifteen years ago. The harvest is noticeable, but not obvious to the casual observer. The western portion of the corridor is part of the Norcross Barnes timber sale, which is proposed to be cut (using a partial cut prescription) within the next three years. To protect the creek and its related values, harvest would not occur within the riparian zone.

Accessibility to the river corridor is by the CCC, Barnes Valley Creek, and Mainhaul cinder roads, as well as by an unnamed dirt road that branches off the Mainhaul road (see map 2-E-3). Barnes Valley Road enters the eastern portion of the river corridor (section 29, T. 39 S., R. 15 E.) for approximately 0.4 miles and the ford on the CCC Road just touches the western boundary of the segment. The Mainhaul Road crosses the river corridor and creek in section 24, T. 39 S., R. 14 E.. An unnamed minimally used dirt road branches from the Mainhaul Road and travels east parallel to the southern bank of the creek (averaging 500 to 2,000 feet from

Table 2-E-5. Potential Classification Summary for Barnes Valley Creek.

Activity	Wild	Scenic	Recreational
Water Quality	DM	M	M
Water Resources Development	M	M	M
Shoreline Development	DM	M	M
Accessibility	DM	M	M

Abbreviations used in this table:
M = Meets
DM = Does not meet

the creek) for approximately 1.5 miles. The eastern portion of the creek is less accessible than the western portion. For the most part, the roads are inconspicuous and screened from view of the creek by vegetation. Primary uses of the road are for access by ranchers and loggers, and for hunting, fishing, trapping, sightseeing, off-road vehicle use, driving for pleasure, and recreation.

Suitability Factors

Current Land Status and Use. The Klamath Falls Resource Area administers approximately 5.4 (out of 5.6) stream frontage miles (on both sides of the creek) which is 96 percent of the river segment, as shown in table 2-E-6. The acreage figures used in the table are approximate.

The major land uses within the one-half mile river corridor are livestock grazing, timber harvest, hunting, fishing, and wildlife habitat. As mentioned previously, Barnes Valley Creek flows through the Pitchlog and Horsefly grazing allotments. The western portion of the creek is generally within a fenced riparian pasture exclosure and is under a flash-grazing system. This means that for five days per year, usually in late May, approximately 200 cows are let in the pasture to graze. Every third year the pasture is rested, that is, no grazing occurs for the entire year. In the rest of the river corridor to the east of this exclosure, the grazing is on a rest rotation system. This means that in April or May cows are allowed to graze for two to four weeks and every fourth year the pasture is rested (not grazed). The eastern portion of the corridor was harvested for timber fifteen years ago using a partial cut harvest method. The western portion of the corridor is part of the Norcross Barnes timber sale, which is proposed to be cut (partial cut harvest method) in the next three years.

Table 2-E-6. Segment Ownership and Status Within the Barnes Valley Creek Corridor.

Ownership	Acres	Precent
BLM Public Domain	1,730	93
Private	60	7
TOTAL	**1,790**	**100**

There are no residential developments or other structures within the river corridor. The private land is zoned for forestry/range.

There are no known mining claims located within the river corridor and no federal mineral leases are in effect. No power lines cross the corridor.

Reasonable Foreseeable Uses of the Land and Water That Would be Affected By Designation. Management guidelines and standards for land uses and management practices appropriate for river areas designated under the National Wild and Scenic Rivers Act are described in the first section of this appendix, called Management Guidelines and Standards for National Wild and Scenic Rivers. Although this assessment has found Barnes Valley Creek not suitable, it was found to be suitable under alternative E for purposes of analysis.

Designation as scenic would lead to VRM Class II management of BLM-administered land in the 1/2-mile river corridor, enhancing its scenic value, and thus, indirectly its recreational use and fish and wildlife habitat value. Development of an interpretive trail along Barnes Valley Creek would be pursued.

Designation as scenic would preclude major diversions, hydroelectric power facilities, water supply or flood control dams, or other major streambank modifications along the creek. No other management activities that could affect the scenic values would be allowed on BLM-administered land.

Livestock grazing could remain at existing levels, but could not be increased if it would affect the free-flowing nature of the creek or the scenic value in the corridor. Designation as scenic would lead to VRM Class II management of BLM-administered lands in the 1/2-mile corridor, including the eastern portion of the corridor, which is now inventoried as VRM Class IV. Because of the timber harvest techniques commonly practiced in the KFRA and the riparian management buffers used, timber harvest in the corridor probably would not be significantly affected. Designation as either scenic or recreational would lead to application of a higher water quality standard, which could possibly require more careful timing of timber harvest on BLM-administered land in the upstream watershed.

Hydroelectric and Other Water Diversion Potential. The potential hydroelectric power available in this stream reach has been determined using information in a 1979 study by the Oregon State University's Water Resources Research Institute (see Introduction of this section of this appendix [Wild and Scenic River Suitability Assessments]). A drainage basin that is approximately 70 square miles and an estimated potential

annual average runoff of 0.30 cfs per square mile (very rough approximation from U.S. Geological Survey stream flow records on nearby streams) yields a streamflow of 18 cfs (70 square miles x 0.30 cfs per square mile), which is significantly below the estimated minimum flow requirements needed for hydroelectric power development (35 cfs). No Federal Energy Regulatory Commission applications or other proposals for dams or diversions are on file for this river segment.

Effects on Outstandingly Remarkable Values (ORVs). Designation would ensure that the scenic quality in the western portion of Barnes Valley Creek corridor would not be diminished and that the eastern portion of the corridor would be enhanced (the eastern portion is currently inventoried as VRM Class IV). Because the scenic resource would be managed under VRM Class II management, the excellent opportunities that exist for solitude and semi-primitive recreation experiences, such as fishing, hunting, and driving for pleasure, would be enhanced, especially in the eastern portion of the corridor. Designation would maintain or enhance the trout and sucker populations by helping to preserve existing habitat. Golden eagle habitat and nesting would continue to be protected. Management of riparian buffers could enhance the riparian vegetation. Highlighting the cultural values in the corridor through protection would enhance their value.

The scenic values could be diminished in the future in the eastern portion of the corridor if the harvest method was more intense than a partial cut prescription. Because the area is inventoried as VRM Class IV, it could be clearcut in the future; however, due to silvicultural considerations, clearcutting would be unlikely. Recreation opportunities could be diminished by the decreased scenic values.

How the River Segment Would Be Managed if it Were Not Designated or if Designated at a Lower Classification. Barnes Valley Creek would be managed with standard riparian management area buffers to protect the riparian area. This would provide protection to the fisheries and riparian habitat from timber harvest activities on BLM-administered land. The grazing systems used in the area (flash grazing and rest rotation grazing) provide additional protection to the riparian vegetation and to the general range condition. Land outside the riparian buffer would be managed under VRM Class II standards in the western portion and under VRM IV standards in the eastern portion of the river area. An existing 40-acre protective buffer around the Barnes Valley petroglyph area would be continued.

If the river were designated as recreational, BLM management would be similar in most respects to management without designation, but administrative costs would be higher.

Cost of Administration. The basic objective of wild and scenic river designation is to maintain the river's existing condition. If a land use or development clearly threatens the ORVs which resulted in the river's designation, efforts will be made to remove the threat through local zoning, land exchanges, purchases from willing sellers, and other actions short of condemnation. In the event condemnation becomes necessary, the only landowner rights that will be purchased are those necessary to remove the threat to the specific ORV, in this case, scenic value. Any actual or potential threat to an ORV, together with specific options to remove or mitigate that threat, can only be determined on a case-by-case basis. Because of variable river values, possible threats, and protection mechanisms, estimated costs of acquiring necessary lands or interests in lands will be made in the river management plan required to be completed within three full fiscal years of designation.

The estimated cost of preparing a required river management plan for this stream segment would be approximately $40,000. Annual river management, administration, and monitoring costs are estimated to be less than $5,000. Cost estimates for resource protection measures and necessary public use facilities would be determined through the river management planning process.

No state or local agency has come forward and stated that they would be willing to share administration costs on this river segment should it become part of the system. In light of the financial constraints imposed by Oregon ballot Measure 5, it is unlikely that state or local agencies would share in these costs.

Administering Agency. If Barnes Valley Creek were added to the National Wild and Scenic Rivers System, the BLM would continue to manage the land and resources it currently administers.

Finding and Rationale

Finding. The 5.6-mile segment of Barnes Valley Creek from the BLM/U.S. Forest Service boundary westward to the ford on the CCC Road, just east of Gerber Reservoir, is found **unsuitable** for federal designation as a scenic river area under the National Wild and Scenic Rivers Act.

Characteristics Which Do or Do Not Make the Area a Worthy Addition to the System. Barnes Valley Creek's outstandingly remarkable value is its scenic resource. Compared to the other rivers that are either designated or are suitable for designation in SCORP region 9 (see map 2-E-1), Barnes Valley Creek's scenic resources are not unique in the region and therefore would make it a marginal potential addition to the National Wild and Scenic Rivers System. The only existing activity in the corridor that has potential to adversely impact the ORV is timber harvest. The area that is proposed to be harvested in the next three years is in an area that is classified as VRM Class II, which would adequately protect the scenic value of the area, and consequently, designation is not necessary to protect that value. The lack of any major public interest in designation of Barnes Valley Creek reinforces the conclusion of unsuitability.

Barnes Valley Creek's scenic ORV is not threatened by dam construction, irrigation development, or private construction; therefore, the BLM believes its Preferred alternative management actions would adequately protect the creek and its resources.

Miller Creek

Summary

The 6.5-mile segment of Miller Creek from just below the Gerber Dam to the mouth of the canyon at Goodlow Rim is found **suitable** for designation as a scenic river under the National Wild and Scenic Rivers Act. The entire corridor is managed by the BLM through a memorandum of understanding with the Bureau of Reclamation. The canyon is part of a Bureau of Reclamation withdrawal, so they have administrative jurisdiction until a Public Land Order is published revoking the withdrawal.

Background

Description of the River. The Klamath Falls Resource Area identified as eligible a 6.5-mile segment of Miller Creek from just below the Gerber Dam in section 12, T. 39 S., R. 13 E. to the mouth of the canyon at Goodlow Rim in section 33, T. 39 S., R. 13 E. where the creek enters the Langell Valley (see map 2-E-4). Two tributaries feed into Miller Creek, Pankey Springs and Schnipps creeks. Flows in Miller Creek are regulated by the Gerber Dam. The creek provides habitat for introduced trout and shortnose sucker (federal endangered), and potential habitat for the Lost River (federal endangered) and Klamath largescale (federal candidate category 2) sucker species. The canyon provides nesting habitat for osprey (one or two active nests), prairie falcons, red-tail hawks, and wood ducks; and potential nesting habitat for peregrine falcons. Antelope and mule deer also use the canyon frequently.

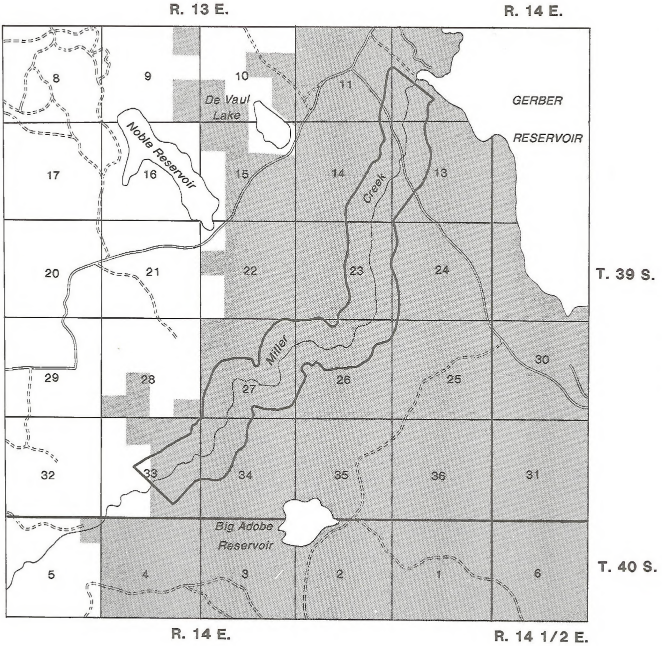
Miller Creek flows through a steep, relatively narrow canyon, which for the most part forms an unbroken divide in the Gerber Plateau. The canyon is typified by large, vertical, basaltic rock walls with lichens of various colors. At the lower end of the canyon, near Goodlow Rim, the canyon walls are over 200 feet high and are comprised of layers of sedimentary rock, which is unusual in this area of mostly volcanic rock. The vegetative communities differ from those that dominate the surrounding plateau because of the lower air temperatures and higher soil moistures in the canyon. Juniper and sagebrush dominate the vegetation outside the canyon. Large old growth ponderosa pines are found in the upper half of the canyon and western juniper is scattered throughout the understory. Wild rose and snowberry are the dominant shrubs, and Idaho fescue is the dominant grass in the canyon with pockets of cheatgrass present. The canyon also contains potential habitat for *Silene nuda ssp. insectivora,* a Bureau assessment plant species.

The riparian zone is dominated by bittercherry and serviceberry, which provide abundant food and habitat for the canyon's songbirds. A number of sedge and willow species are also present in the riparian zone. The riparian zone is in relatively good condition, although livestock grazing occurs in the canyon and the stream level fluctuates widely due to dam releases.

Semi-primitive non-motorized recreation opportunities (see appendix 2-D for definitions) are available in the canyon. Significant opportunities exist for solitude, wildlife and waterfowl viewing, camping, hiking, and hunting. A semi-developed campsite lies just outside the corridor in section 13 T. 39 S., R. 13 E.. Primitive hunter camps are located where the Round Valley Road crosses the creek. No other recreation sites are within the corridor.

Two known cultural (prehistoric) sites, a small lithic scatter, and a group of stone house rings, are located along the top edge of the canyon. The BLM has not inventoried within the canyon for cultural sites; however, it is suspected that sites do exist there.

Eligibility Determination. To be eligible for inclusion in the National Wild and Scenic Rivers System, a river or river segment must be free-flowing and must posess at least one outstandingly remarkable value (ORV). The definition of free-flowing and guidelines for what makes a resource outstandingly remarkable can be found in the Wild and Scenic River Eligibility and Classification Determinations section of this appendix.



LEGEND

BLM Administered Lands

River Corridor

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management

Klamath Falls R. A. 1992 RMP/EIS

WILD AND SCENIC RIVER
ELEGIBILITY & SUITABILITY REPORT

MILLER CREEK

N

1 0 1 Mile

Miller Creek, regulated by the Gerber Dam, is free-flowing within the study segment. Not all of the study segment is perennial. It has outstandingly remarkable scenic values, as evidenced by the geologic features and vegetative diversity. Miller Creek flows through a steep, narrow canyon, which is the predominant geologic feature in the Gerber Plateau region. The canyon's basaltic rock walls are covered with colorful lichens; multi-storied old growth ponderosa pines mixed with an understory of western juniper grow throughout the canyon along with wild rose, snowberry, and Idaho fescue. Bittercherry and serviceberry are common in the riparian zone. This is a noticeable change from the slightly rolling terrain of the arid Gerber Plateau, which is vegetated by a mix of low sagebrush, western juniper, localized areas of ponderosa pine, Idaho fescue, bottlebrush squirreltail, Sandbergs bluegrass, and cheatgrass. The BLM's 1989 Visual Resource Inventory categorized this area as Scenic Quality A (the highest classification), and as visual resource management (VRM) Class II (see the Visual Resources section of Management Direction Common to All Alternatives in chapter 2 for VRM Class objectives).

Miller Creek has significant, but not outstandingly remarkable, fish, wildlife, and recreation values. The fishery value is significant because the creek provides habitat for introduced trout and the federal and state endangered shortnose sucker, as well as potential habitat for the federal and state endangered Lost River sucker and the federal candidate category 2 Klamath largescale sucker. The large trees and steep cliffs in the canyon provide nesting habitat for osprey, prairie falcons, red-tail hawks, wood ducks, and other waterfowl, as well as potential nesting habitat for peregrine falcons; big game animals (antelope and mule deer) also use the canyon. The combination of wildlife habitats and populations represent a significant resource. Recreation opportunities, such as camping, hunting, and hiking are all available in a semi-primitive scenic setting, resulting in a significant recreational value.

The Miller Creek canyon was nominated by the Nature Conservancy for designation as an area of critical environmental concern, which is being analyzed in this plan.

Classification Determination. Classification is based on the degree of naturalness and extent of development of the river and its adjacent lands, as they exist at the time of the study, using four criteria: water quality, water resource development, shoreline development, and accessibility. A description of the criteria can be found in the Wild and Scenic River Eligibility and Classification Determinations section of this appendix. Miller Creek's highest potential classification is scenic, as shown in table 2-E-7. The *Oregon Statewide Assessment of Nonpoint Sources of Water Pollution* (DEQ 1988) identified moderate streambank erosion problems in Miller Creek, impacting aquatic life and wildlife. Water quality in rivers classified as a scenic or recreational river area is not required to continually meet or exceed federally approved state standards; therefore, current water quality does not affect its qualifications for inclusion in the National Wild and Scenic Rivers System (NWSRS).

Miller Creek is free of any major impoundments, diversions, or other modifications of the waterway. The presence of impoundments above and/or below the segment (including those that regulate the flow regime through the segment, such as is the case with Miller Creek) will not by themselves render a river ineligible.

There are many river segments in the NWSRS that are downstream from major dams, such as the Rogue River in Oregon and the lower Klamath River in California. The waterway has been slightly modified in section 13, T. 39 S., R. 13 E., where a culvert was installed and the road crosses the creek.

Miller Creek has no shoreline developments, such as farm structures, dwellings, or row crops. The study segment flows through three livestock grazing allotments (Horsefly [#882], Dry Prairie [#885], and Pankey Basin [#884]). Grazing occurs in the Gerber Plateau uplands more than in the canyon; however, the livestock graze in the canyon during the summer, using the creek as a water source. Timber harvest occurred in the north end of the canyon approximately seven or eight years ago using a partial cut prescription. The river corridor is not planned for timber harvest in the next 10 years, although the potential exists for salvage harvest.

Accessibility to the river corridor is by Round Valley cinder road. This road crosses the northern part of the creek in section 13, T. 39 S., R. 13 E. An unimproved jeep trail, which begins at the Round Valley Road, parallels the east bank of the creek for approximately 0.5 miles and dead ends. There is no access to the southern part of the creek and no other roads enter the corridor. Primary uses of Round Valley Road are for recreational activities, such as fishing, hiking, sightseeing, boating in the Gerber Reservoir, and driving for pleasure; and for access by local residents.

Table 2-E-7. Potential Classification Summary for Miller Creek.

Activity	Wild	Scenic	Recreational
Water Quality	DM	M	M
Water Resources Development	M	M	M
Shoreline Development	M	M	M
Accessibility	DM	M	M

Abbreviations used in this table:
M = Meets
DM = Does not meet

Suitability Factors

Current Land Status and Use. The Klamath Falls Resource Area BLM owns approximately 6.5 stream frontage miles (on both sides of the creek) and 2,080 acres, which is 100 percent of the river corridor. This land is part of the Bureau of Reclamation's Klamath Project withdrawal (OR 20253). The withdrawal has been relinquished by the Bureau of Reclamation and reviewed by the BLM, who recommended that the withdrawal be revoked because it was determined that the land is suitable for return to the public domain. The Bureau of Reclamation remains responsible for administration of these lands until the Public Land Order that will revoke the withdrawal is published. Management of the resources (specifically fire suppression, livestock grazing, timber harvest, and recreation) on the withdrawn land is performed by the BLM under the national BLM/Bureau of Reclamation memorandum of understanding and the local memorandum of understanding between the Lakeview District BLM and the Klamath Basin Project office of the Bureau of Reclamation.

Land use within the one-half mile river corridor is predominantly recreation-related. Fishing and boating are popular on Gerber Reservoir, which is adjacent to the study segment. Fishing also occurs on Miller Creek, and hiking, sightseeing, and camping, among other uses, are popular in the canyon. Timber harvest in the canyon has been limited and is not anticipated during the life of the plan. Livestock grazing occurs in the river corridor, mainly in the uplands, although livestock have been known to go down into the canyon for water. As mentioned previously, Miller Creek flows through three grazing allotments. The Horsefly and Dry Prairie allotments are grazed during April and May, with the animals in any one area for two to three weeks at a time. The Pankey Basin allotment is grazed from May 15 to August 31 currently, and would be grazed from May 1 to August 1 under the Preferred alternative.

There are no residential developments, other structures, or power lines within the corridor.

There are no known mining claims located within the study area and no federal mineral leases are in effect.

Reasonable Foreseeable Uses of the Land and Water Which Would be Affected By Designation. Management guidelines and standards for land uses and management practices appropriate for river areas designated under the National Wild and Scenic Rivers Act are described in the first section of this appendix, called Management Guidelines and Standards for National Wild and Scenic Rivers. Although this assessment has found Miller Creek not suitable, it was found to be suitable under alternative E for purposes of analysis.

Designation as a scenic river area would ensure the scenic value would be maintained in the long term; therefore, the user's recreational experience would be indirectly maintained or enhanced. The fish and wildlife (sucker and raptor) habitat would be maintained or enhanced. Greater management attention would be placed on protection of the sensitive plant species *Silene nuda ssp. insectivora* habitat. If the creek were designated as a recreational river area, BLM management would be similar in most respects to management without designation.

Designation as scenic would preclude major diversions, hydroelectric power facilities, water supply or flood control dams, or other major streambank modifications along the creek. No other management activities that could affect the scenic values or free-flowing character would be allowed.

Existing uses could continue in the corridor at current levels. Increased levels of any uses or activities could be curtailed if they would harm the outstandingly remarkable scenic values or free-flowing character of the stream. Existing and future water rights, such as releases from Gerber Dam, would not be affected by designation, as described under section 13 of the National Wild and Scenic Rivers Act.

Hydroelectric and Other Water Diversion Potential. The potential hydroelectric power available in this stream reach has been determined using information in a 1979 study by the Oregon State University's Water Resources Research Institute (see Introduction of this section of this appendix [Wild and Scenic River Suit-

ability Assessments]). A drainage basin that is approximately 230 square miles and an estimated potential annual average runoff of 0.25 cfs per square mile (very rough approximation from U.S. Geological Survey stream flow records on nearby streams) yields a streamflow of 57.5 cfs (230 square miles x 0.25 cfs per square mile), which is above the estimated minimum flow requirements needed for hydroelectric power development (35 cfs). The Gerber Dam (above Miller Creek) could be modified to generate electrical power even if Miller Creek were designated as a scenic river area, as long as the modifications were outside the designated boundary and Miller Creek's scenic value or free-flowing character are not adversely affected by this modification. No Federal Energy Regulatory Commission applications or other proposals for dams or diversions are on file for this river segment.

Effects on Outstandingly Remarkable Values (ORVs). Designation as a scenic river area would maintain the scenic ORV through long-term continuation of VRM Class II management in the 1/2-mile river corridor. No management activities would be allowed that could adversely affect the scenic resources in the study area. Significant resource values, including recreation and fish and wildlife habitat, would also be maintained or enhanced. If the scenic resources are protected, then so will the quality of the semi-primitive recreation experience. Designation would maintain or enhance wildlife populations by helping to preserve existing habitat. Protection of fish habitat would maintain, but not necessarily enhance, fish populations.

Mining, timber harvest, or other activities could diminish the outstandingly remarkable scenic resource in the canyon. Long-term protection of the scenic value would not be ensured without designation. Those activities could still occur with designation, but with restrictions. Increased use of the canyon with designation would increase the potential for impacting undiscovered cultural sites.

How the River Segment Would Be Managed if it Were Not Designated or if Designated at a Lower Classification. Miller Creek would be managed as an area of critical environmental concern (ACEC) whether or not it were designated as a scenic river area. Management restrictions associated with the ACEC designation would include the following. Land in the ACEC would not be available for planned timber harvest, although salvage harvest would be permitted if necessary. Livestock grazing would be restricted and mineral leasing would be subject to a no surface occupancy stipulation. Miller Creek would be managed with standard riparian management area buffers to protect the riparian zone and fish habitat. VRM Class II management objectives would be followed. The scenic resources in the canyon would not be guaranteed long-term protection.

If the river were designated as a recreational river area, BLM management would be similar to management without designation. Management actions would be less restrictive than those on a scenic river area. A description of guidelines and standards for land uses and management practices for scenic and recreational river areas can be found in the first section of this appendix, called Management Guidelines and Standards for National Wild and Scenic Rivers.

Cost of Administration. The basic objective of wild and scenic river designation is to maintain the river's existing condition. Any actual or potential threat to an ORV, together with specific options to remove or mitigate that threat, can only be determined on a case-by-case basis. Because of variable river values, possible threats, and protection mechanisms, estimated costs of mitigating those threats would be made in the river management plan required to be completed within three full fiscal years of designation. The largest costs usually are associated with potential actions on private lands within the corridor, where acquisition or other options could be necessary to remove a threat. Because 100 percent of the land in the Miller Creek corridor is administered by the BLM, this cost would not be an issue.

The estimated cost of preparing a required river management plan for this stream segment would be approximately $40,000. Annual river management, administration, and monitoring costs are estimated to be less than $5,000. Cost estimates for resource protection measures would be determined through the river management planning process, which would occur after Congressional designation.

No state or local agency has come forward and stated that they would be willing to share in the administration costs on this river segment should it become part of the system. In light of the financial constraints imposed by Oregon ballot Measure 5, it is unlikely that state or local agencies would share in these costs.

Administering Agency. If Miller Creek were added to the National Wild and Scenic Rivers System, the BLM would continue to manage all of the land and resources it currently administers in the river corridor.

Finding and Rationale

Finding. The 6.5-mile segment of Miller Creek from just below the Gerber Dam to the mouth of the canyon at Goodlow Rim where the creek enters the Langell

Valley is found **suitable** for federal designation as a scenic river area under the National Wild and Scenic Rivers Act.

Characteristics Which Do or Do Not Make the Area a Worthy Addition to the System. The suitability of Miller Creek with its scenic ORV is compared with other rivers, both designated and studied, in SCORP region 9 (see map 2-E-1). Many of the region's rivers also have outstandingly remarkable scenic resources. Miller Creek, the eastern-most river segment in the SCORP region, flows through the Basin and Range geographical province, which is very different from the rest of the SCORP region and this contributes to its outstandingly remarkable scenic value. The steep, narrow basaltic river canyon possesses a cooler, moister environment than that of the surrounding arid, slightly rolling terrain of the Gerber Plateau region. The plateau is divided by Miller Creek. The water flow, which is perennial in normal or near-normal precipitation years, serves as a valuable water source in the area. The canyon rim forms a shaded, protected environment that provides habitat for a diversity of wildlife. This diverse wildlife habitat is very important in the area. The vegetative community in the canyon differs from that of the surrounding plateau because of its slightly milder climate. Miller Creek canyon is the only place in the Gerber Plateau where diverse old growth ponderosa pine stands and riparian habitats are well represented and of high quality. The steep canyon walls have naturally restricted, although not eliminated, livestock grazing and timber harvest activities in the canyon, thus the imprint of humans has also been restricted.

The study area is 100 percent managed by the BLM, as is much of the land in the Gerber Plateau area; consequently the BLM counld influence upstream management activities that could potentially affect Miller Creek below the Gerber Reservoir.

Public comment both supports and opposes the designation of Miller Creek as a scenic river area. Besides the controversial upper Klamath River, Miller Creek is the only river studied by the Klamath Falls Resource Area that received any public interest.

Although the study area is unique in the SCORP region, the scenic ORV is not threatened by dam construction, irrigation development, or private construciton; therefore, the BLM believes its Preferred alternative management actions, which would include managing the area as an ACEC, would adequately protect the creek and its resources. Management as an ACEC would provide much of the same protection provided from a scenic river designatin, except that protection would not be guaranteed in the long term. All ACECs are reviewed for continued protection or revokation at the beginning of every resource management planning cycle (generally every 10 years.

Spencer Creek

Summary

The 3.0-mile segment of Spencer Creek from the section line between sections 20 and 21 of T. 38 S., R. 6 E. to the township boundary between T. 38 S. and T. 39 S. is found **not suitable** for designation as a scenic river under the National Wild and Scenic Rivers Act. The BLM has 43 percent administrative jurisdiction in the Spencer Creek corridor.

Background

Description of the River. The Klamath Falls Resource Area identified as eligible a 3.0-mile segment from the section line between sections 20 and 21 of T. 38 S., R. 6 E. to the township boundary between T. 38 S. and T. 39 S. (see map 2-E-5). Miners Creek is the only tributary that feeds into the studied segment of Spencer Creek. Both Miners Creek and Spencer Creek have perennial flows. Spencer Creek provides year-round high quality spawning habitat for wild rainbow trout and important rearing habitat for juvenile trout. The corridor, which is used as foraging and nesting habitat for bald eagles, has an active bald eagle nest. The corridor and surrounding area also provides foraging and nesting habitat for northern spotted owls (federal threatened species), with perch trees and nesting structures present in the corridor. An active pair of spotted owls was found near the corridor in 1992.

Spencer Creek flows in a canyon that has moderate to steep walls with rock outcroppings and lava flows, through a series of waterfalls with many pools and drops. The overstory is a mixed conifer forest comprised of white fir, Douglas fir, sugar pine, ponderosa pine, and some lodgepole pine.

The recreation opportunities attract local visitors. Recreation activities in the corridor are predominantly fishing and hiking. The corridor is classified as a semi-primative to roaded natural recreation setting (see appendix 2-D for definitions), with many opportunities for solitude, high quality angling, and bald eagle and waterfowl viewing. No developed recreation sites are found along the river segment.

R. 6 E.

LEGEND

BLM Administered Lands

River Corridor

-N-

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management

Klamath Falls R. A. 1992 RMP/EIS

WILD AND SCENIC RIVER
ELIGIBILITY & SUITIBILITY REPORT

SPENCER CREEK

1 0. 1 Mile

The Spencer Creek Watershed, of which the study segment of the creek is a small portion, has a coordinated resource management plan (CRMP) in effect. The plan, which was finalized in July 1990 and signed by several agencies, interest groups, and individuals, emphasizes the coordinated management of public and private lands and resources, including fisheries, livestock grazing, timber, recreation, transportation, and the riparian corridor. The CRMP is on file at the Klamath Falls Resource Area office.

Eligibility Determination. To be eligible for inclusion in the National Wild and Scenic Rivers System, a river or river segment must be free-flowing and must posess at least one outstandingly remarkable value (ORV). The definition of free-flowing and guidelines for what makes a resource outstandingly remarkable can be found in the Wild and Scenic River Eligibility and Classification Determinations section of this appendix. Spencer Creek is free-flowing within the study segment; its two ORVs are scenic and fishery values. Spencer Creek provides an outstanding example of a highly diverse, multi-storied, multi-species, old growth forest found on the eastern slopes of the Cascade Range. Moderate to steep canyon walls, with rock outcrops and lava flows are found along the creek. Spencer Creek flows through a series of small waterfalls with many pools and drops. All these elements combined result in an outstanding scenic value. It is inventoried as visual resource management (VRM) Class III by the BLM (see the Visual Resources section of Management Direction Common to All Alternatives in chapter 2 for VRM Class objectives).

Spencer Creek is one of only two streams that provide spawning habitat for the wild rainbow trout population that inhabits the upper Klamath River. This creek provides year-round high quality habitat necessary for trout reproduction and also serves as important rearing habitat for juvenile trout.

Classification Determination. Classification is based on the degree of naturalness and extent of development of the river and its adjacent lands, as they exist at the time of the study, using four criteria: water quality, water resources development, shoreline development, and accessibility. A description of the criteria can be found in the Wild and Scenic River Eligibility and Classification Determinations section of this appendix. Spencer Creek's highest potential classification is scenic, as shown in table 2-E-8. The *Oregon Statewide Assessment of Nonpoint Sources of Water Pollution* (DEQ 1988) identified a moderate sedimentation problem affecting fisheries in Spencer Creek. Water quality for rivers classified as scenic or recreational is not required to continually meet or exceed federally approved state standards; therefore, current water quality does not affect its qualifications for inclusion in the National Wild and Scenic Rivers System.

Spencer Creek is free of any major impoundments, diversions, or other modifications of the waterway. The creek runs through a large culvert on the Spencer Creek Hook Up road in section 34 T. 38 S., R. 6 E.

There are no shoreline developments, such as structures or dwellings. The study segment flows through the Grubb Spring livestock grazing allotment (#147). Timber harvest has occurred in the past 10 years. Generally stands have been entered (cut) every six or seven years, using light selective cuts. Some heavier, shelterwood cuts have occurred in some stands. With shelterwood cuts, some of the larger trees are left to protect understory trees from frost damage. The BLM-administered land in the corridor is part of the planned Aspen-Clover timber sale, which is scheduled as a 1993 sale. It would be cut within three years. The past timber harvest is noticeable from the creek, but not obvious to the casual observer. To protect the creek and its related values, timber harvest would not occur within the riparian zone.

Accessibility to the area is by the Spencer Creek Hook Up (BLM road), Clover Creek County Road, and Keno Road (BLM). All these roads are paved. The Clover Creek road enters the river corridor in section 21, T. 38 S., R. 6 E. for approximately 0.8 miles and generally is inconspicuous and screened from view of the creek; the Spencer Creek hook up road crosses the creek in section 34, T. 38 S., R. 6 E. Primary uses of the road are for timber harvest and recreation, such as fishing, hunting, sightseeing, and driving for pleasure.

Table 2-E-8. Potential Classification Summary for Barnes Valley Creek.

Activity	Wild	Scenic	Recratlonal
Water Quality	DM	M	M
Water Resources Development	M	M	M
Shoreline Development	M	M	M
Accessibility	DM	M	M

Abbreviations used in this table:
M = Meets
DM = Does not meet

Suitability Factors

Current Land Status and Use. The Klamath Falls Resource Area administers approximately 1.6 (out of 3.0) stream frontage miles (on both sides of the creek), and approximately 43 percent of the total land ownership in the river corridor, as shown in table 2-E-9. The acreage figures used in the table are approximate.

The major land uses within the one-half mile wide river corridor are timber harvest, livestock grazing, and recreation uses, such as hunting, hiking, and fishing. The Spencer Creek corridor is within the BLM's Aspen-Clover timber sale, which would be sold in 1993 and cut two or three years after that. It has also been part of other timber sales in the past 10 years. The timber stands in this area have been entered every six or seven years, predominantly using a light selective cut, with periodic regeneration cuts that only leave larger seed trees for shelter. Timber harvest on Weyerhauser land within the corridor has included both clearcut and partial cut, with some protection of the riparian zone. The corridor lies within the Grubb Springs livestock grazing allotment. Currently, this allotment is grazed from May 1 to September 30 with no special grazing system. Under the preferred alternative, the grazing would be from May 1 to August 15.

There are no residential developments or other structures within the river corridor. The private land is zoned for forestry.

There are no known mining claims located within the river corridor and no federal mineral leases are in effect. No power lines cross the corridor.

Reasonable Foreseeable Uses of the Land and Water Which Would be Affected By Designation. Management guidelines and standards for land uses and management practices appropriate for river areas designated under the National Wild and Scenic Rivers Act are described in the first section of this appendix, called Management Guidelines and Standards for National Wild and Scenic Rivers. Although this assessment has found Spencer Creek not suitable, it was found to be suitable under alternative E for purposes of analysis.

Designation as a scenic river area would lead to VRM Class II management of BLM-administered land in the 1/2-mile river corridor, enhancing its scenic value, and thus, indirectly the user's recreational experience. Bald eagle and northern spotted owl habitat would be maintained or enhanced by designation. If the river segment were designated, the BLM's role in implementing the Spencer Creek CRMP would be strengthened, which would aid in the improvement of fish and riparian habitat and recreation opportunities, while maintaining livestock grazing and timber production.

Designation as scenic would preclude major diversions, hydroelectric power facilities, water supply or flood control dams, or other major streambank modifications along the creek. No other management activities that could affect the scenic or fishery values would be allowed on BLM-administered land.

Designation as scenic would lead to VRM Class II management of BLM-administered lands in the 1/2-mile corridor (currently inventoried as VRM Class III), possibly restricting timber management on those lands and diminishing the rate of timber harvest from them, although past timber harvest has been conducted with a light cut. Designation as either scenic or recreational would lead to application of a higher water quality standard, which could require more precise timing of BLM timber sales in the upstream watershed. The level of livestock grazing (number of AUMs) could not increase above the current level. The current season of use for grazing could be shortened if the grazing practices were harming the fishery or scenic values in the corridor. Other uses could be curtailed if the existing use level would diminish fishery or scenic values in the study corridor.

Hydroelectric and Other Water Diversion Potential. The potential hydroelectric power available in this stream reach has been determined using information in a 1979 study by the Oregon State University's Water Resources Research Institute (see Introduction of this section of this appendix [Wild and Scenic River Suitability Assessments]). A drainage basin that is approximately 45 square miles and an estimated potential annual average runoff of 0.44 cfs per square mile (very rough approximation from U.S. Geological Survey

Table 2-E-9. Segment Ownership and Status Within the Spencer Creek Corridor.

Ownership	Acres	Precent
BLM O&C lands	440	46
Private Weyerhaeuser Timber Company	520	54
TOTAL	**960**	**100**

stream flow records on nearby streams) yields a streamflow of 20 cfs (45 square miles x 0.44 cfs per square mile), which is significantly below the estimated minimum flow requirements needed for hydroelectric power development (35 cfs). No Federal Energy Regulatory Commission applications or other proposals for dams or diversions are on file for this river segment.

Effects on Outstandingly Remarkable Values (ORVs). The Spencer Creek corridor is inventoried as VRM Class III, designation as a scenic river area would lead to VRM II management of BLM-administered land in the 1/2-mile river corridor, enhancing its scenic value. With more management attention focused on this area, if designated, the fishery value (both habitat and population) could be enhanced in cooperation with other agencies, such as the Oregon Department of Fish and Wildlife, and landowners, such as the Weyerhaeuser Timber Company.

The scenic value would be managed under VRM Class III objectives if the river segment were not designated, which could slightly diminish its value compared to management at a VRM Class II level. The fishery value would not be adversely affected by non-designation.

How the River Segment Would Be Managed if it Were Not Designated or if Designated at a Lower Classification. Spencer Creek would be managed with standard riparian management area buffers to protect the riparian zone. This would provide some protection to the fisheries and riparian habitat from timber harvest activities on BLM-administered land. The corridor would be managed under VRM Class III objectives. The CRMP would be followed in cooperation with the other parties involved.

If Spencer Creek were designated as a recreational river area, BLM management would be similar in most respects to management without designation, but administrative costs would be higher.

Cost of Administration. The basic objective of wild and scenic river designation is to maintain the river's existing condition. If a land use or development on private land clearly threatens the ORVs which resulted in the river's designation, efforts will be made to remove the threat through local zoning, land exchanges, purchases from willing sellers, and other actions short of condemnation. In the event condemnation becomes necessary, the only landowner rights which will be purchased are those necessary to remove the threat to the specific ORV, in this case, scenic and fishery values. Any actual or potential threat to an ORV, together with specific options to remove or mitigate that threat, can only be determined on a case-by-case basis. Because of variable river values, possible threats and protection mechanisms, estimated costs of acquiring necessary lands or interests in lands will be made in the river management plan required to be completed within three full fiscal years of designation.

The estimated cost of preparing a required river management plan for this stream segment would be approximately $40,000. Annual river management, administration, and monitoring costs are estimated to be less than $5,000. Cost estimates for resource protection measures and necessary public use facilities would be determined through the river management planning process.

No state or local agency has come forward and stated that they would be willing to share in the administration costs on this river segment should it become part of the system. In light of the financial constraints imposed by Oregon ballot Measure 5, it is unlikely that state or local agencies would share in these costs.

Administering Agency. If Spencer Creek were added to the National Wild and Scenic Rivers System, the BLM would continue to manage the land and resources it currently administers.

Finding and Rationale

Finding. The 3.0-mile segment of Spencer Creek from the section line between sections 20 and 21 of T. 38 S., R. 6 E. to the township boundary between T. 38 S. and T. 39 S. is found **unsuitable** for designation as a scenic river area under the National Wild and Scenic Rivers Act.

Characteristics Which Do or Do Not Make the Area a Worthy Addition to the System. Spencer Creek's outstandingly remarkable values are its scenic and fishery resources. Compared to the other rivers that are either designated or are suitable for designation in SCORP region 9 (see map 2-E-10), Spencer Creek's ORVs are not unique, and therefore would make a marginal potential addition to the National Wild and Scenic Rivers System. Timber harvest and livestock grazing have the potential to adversely impact the ORVs in the corridor; however, considering the riparian management area buffers and the harvest methods generally employed on BLM-administered land in the past, the impact from timber harvest is not considered to be severe, and consequently, designation would not be necessary to protect those values on BLM-administered land. Impacts from livestock grazing, including sedimentation and other factors that could affect water quality and the fishery, could be mitigated through the CRMP. Federal designation would not have a direct, immediate effect on private lands in the corridor owned

by the Weyerhauser Timber Company and therefore would not necessarily protect the scenic values on those lands. The lack of any major public interest reinforces the conclusion of unsuitability.

Spencer Creek's scenic and fishery ORVs are not threatened by dam construction, irrigation development, or private construction; therefore, the BLM believes its Preferred alternative management actions would adequately protect the creek and its resources. The Preferred alternative would include special area management and continued implementation of objectives in the Spencer Creek Coordinated Resource Management Plan.

Upper Klamath River

Summary

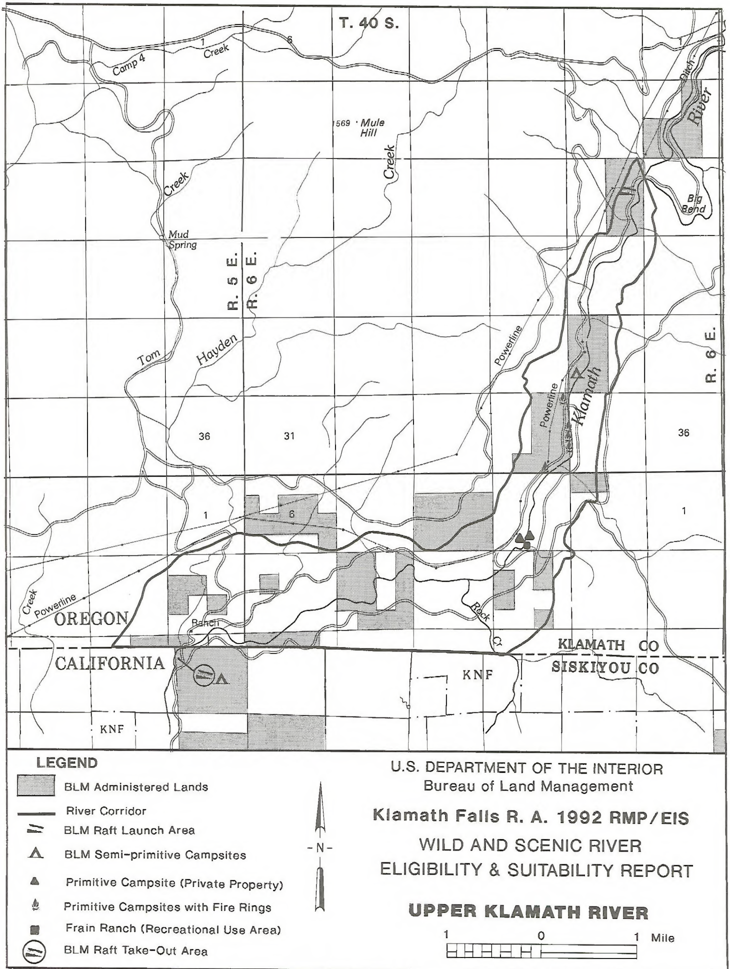
The 11.0-mile segment of upper Klamath River from just below the John C. Boyle Powerhouse to the Oregon-California state line and from rim to rim is found **suitable** for designation as a scenic river under the National Wild and Scenic Rivers Act (NWSRA). The BLM has 75 percent administrative jurisdiction in the upper Klamath River corridor.

Background

Three segments of the upper Klamath River were studied by the Klamath Falls Resource Area (KFRA) for eligibility, classification, and suitability. This study, documented in the Final Eligibility and Suitability Report for the Upper Klamath Wild and Scenic River Study (1990), was prepared in accordance with section 5(d) of the Wild and Scenic Rivers Act of 1968, which was amended by section 104 of the Omnibus Oregon Wild and Scenic Rivers Act of 1988 (Public Law 100-557, October 28, 1988). An extensive public input process was conducted during the study; a draft study report was published in November 1989. Over 1,000 comments were received and considered during the public comment period, with the draft significantly modified to include the substantive comments, and the final study report was published in April 1990. Most of the information in this suitability assessment was taken from that final study report. If more information is desired, copies of the report are available from the KFRA office.

Description of the River. The KFRA identified as eligible an 11.0-mile river segment (segment 2) from just below the John C. Boyle Powerhouse (river mile [RM] 220.3) in section 14, T. 40 S., R. 6 E. to the Oregon-California state line (RM 209.3) in section 13, T. 41 S., R. 5 E. (see map 2-E-6). Two other segments of the upper Klamath River were also studied. Segment 1 is the 4.2-mile section from the John C. Boyle Dam (RM 224.5) to the John C. Boyle Powerhouse (RM 220.3), and segment 3 is the 5.3-mile section from the Oregon-California state line (RM 209.3) to the slackwater of Copco Reservoir in California (RM 204). Segment 1 was determined to be ineligible because of the major modification of the waterway and the significant continuous diversion of water from the Boyle hydroelectric project, which was built in 1958. The final study report describes the eligibility finding in detail. Segment 3 was determined eligible. Because it is managed out of the BLM Redding (California) Resource Area office, it is not discussed extensively in Klamath Falls' RMP/EIS. Segment 3 was studied with the Oregon river segments for several reasons; the main reason was because resource values do not stop at state lines. For example, the total recreation value and experience includes both segments 2 and 3. It is mentioned in this suitability assessment when necessary to present the total resource value of the upper Klamath River. The eligibility, classification, and suitability findings of segment 3 are contained in the Final Eligibility and Suitability Report for the Upper Klamath Wild and Scenic River Study. The management objectives are contained in the Redding Resource Area's Draft RMP (1991) and in the Proposed Action for Section 3 of the Upper Klamath River section of this appendix.

The Klamath River lies within the High Cascades physiographic province and borders the Basin and Range province on the west. Because of its location, there is important biological diversity found within the canyon. Several tributaries and springs flow into the upper Klamath River, including Hayden and Rock creeks. Spencer Creek, another study river in the KFRA flows into the river in section 29, T. 39 S., R. 7 E., which is upstream from segment 1. Flows in segment 2 are highly variable due to the year-round releases of water from the John C. Boyle Dam/Powerhouse system. Summer flows typically range from approximately 350 cubic feet per second (cfs) when no water is being released (approximately 1,500 cfs with one generator operating) to approximately 2,500 cfs when both generators are operating. Segment 2 of the upper Klamath River is inhabited by at least 15 known native and introduced fish species. Wild rainbow trout are the primary game fish in the river. Two federal endangered species, the Lost River and shortnose suckers, and a federal candidate category 2 species, the Klamath largescale sucker, occur in the upper Klamath River. Other native species in the river include the Klamath smallscale sucker, blue and tui chub, marbled sculpin, and Pacific lamprey.



U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management

Klamath Falls R. A. 1992 RMP/EIS

WILD AND SCENIC RIVER
ELIGIBILITY & SUITABILITY REPORT

UPPER KLAMATH RIVER

The diverse terrestrial habitat within the study area supports a large number of wildlife species (birds, mammals, reptiles, and amphibians) that either reside within the canyon or use the canyon and river habitat to some extent. At least 16 species of raptors, 8 species of waterfowl, 8 upland gamebirds, and 66 non-game birds either reside in the canyon year-round, migrate through, or are seasonal inhabitants. Bald eagles, osprey, prairie falcon, and American kestrel are known to nest in the canyon. Peregrine falcons, a federal endangered species, historically nested and are periodically sighted in the canyon. Wet meadows adjacent to slow moving portions of the river provide feeding, resting, and nesting habitat for several water-fowl species, including Canada geese, wood ducks, common mergansers, Tundra swans, and the double-crested cormorant. Meadows, oak grasslands, and dense brush are important habitats for feeding and brood rearing of upland gamebirds, such as California and mountain quail, wild turkey, and chukar. The diverse plant communities in the canyon provide important nesting, foraging, and wintering habitat to many non-game birds, including robins, juncos, chickadees, and two Oregon state sensitive species (western bluebirds and acorn woodpeckers).

The canyon provides habitat to support a great variety and abundance of mammals. Small mammals, such as bats, rabbits, chipmunks, silver gray squirrels, and other small rodents, are plentiful and provide an abundant prey base for the many predators. Beaver and muskrat are commonly found along the river. The Townsend's big-eared bat, a federal candidate category 2 species is found in segment 2. Bobcat, raccoon, river otter, mink, fisher, ringtails, and long- and short-tailed weasels, which are all predators, inhabit the canyon. Big game mammals occurring in the study area include black-tailed deer, Roosevelt elk, black bear, and cougar. Part of the canyon lies within a larger area designated by the BLM and the Oregon Department of Fish and Wildlife as critical deer winter range.

A total of 28 species of herptiles (reptiles and amphibians) potentially occur within the study area. Talus slopes and rocky hillsides provide good habitat for lizards and den sites for snakes, while amphibians inhabit moist sites around seeps, springs, and along the river. Common reptiles, such as western rattlesnake, gopher snake, western skink, and western toad (among others) are found in the study area along with two Oregon state sensitive species (California mountain kingsnake and western pond turtle [also a federal candidate category 2 species]).

Topography in the study area varies from flat to gently sloping along the river benches to near-vertical basalt cliffs, which rise to 1,000 feet above the water. The upper Klamath River Canyon exhibits unique and diverse plant communities, due in part to the varied topography, aspect, elevation, soil type, and microclimates within the canyon. The Klamath River is one of only three rivers that bisect the Cascade Range (the others are the Columbia River in Oregon and the Pit River in California), cutting through distinct vegetative zones, adding to the diversity. The major plant communities found in the study area are mixed conifer forest with old growth ponderosa pines, pine/juniper, pine/oak forest, oak forest, and oak/shrub. Meadows and riparian zones occur within the study area, but are small and limited to specific sites and conditions.

The upper Klamath River Canyon is the predominant visual element in the region. The high desert canyon cuts across the southeastern corner of the surrounding plateau. This extensive plateau is characterized by regular rolling topography; whereas, the canyon exhibits considerably more landform variety with cliffs, steep slopes, upland benches, alluvial terraces, and a meandering river channel, all of which can be encompassed in a single view. The canyon was evaluated by the BLM in 1977 and 1981 and received a Scenic Quality Class A evaluation, the highest scenic quality classification. Based on this classification the area was then classified as visual resource management (VRM) Class II (see the Visual Resources section of Management Direction Common to All Alternatives in chapter 2 for VRM Class objectives).

The study area is rich in cultural resources. Traditional use of the upper Klamath River Canyon by Native Americans began before contact with Euro-americans and continues into the present. Much of the canyon has been surveyed in the last 30 years, initially by the University of Oregon in the early 1960s as prompted by the construction of the John C. Boyle Powerhouse and Dam and more recently by the City of Klamath Falls as part of the proposed Salt Caves hydroelectric project. During these surveys, 45 prehistoric sites were located, including pit house villages, stone rings, lithic scatters, burial sites, a quarry site, and a rock shelter, demonstrating intense prehistoric use of the canyon by Native Americans. This use dates back approximately 7,000 years. The upper Klamath River Canyon has also been used by Euro-americans since the 1850s. Several historic sites remain as a result of this use, including the stagecoach-freight road known as the Topsy Road, Beswick Hotel and Klamath Hot Springs (both in segment 3), livery stops at the Way Station Ranch and Overton Station, Kerwin Ranch, Frain Ranch, Way Cemetery, Topsy School, and a log chute (in segment 3). Today, members of the Klamath Tribe and the Shasta Nation continue to use the canyon for spiritual purposes, hunting, fishing, gathering, and other cultural activities. The river and canyon are

considered to be sacred by the Klamath and Shasta, because of historical use by tribal ancestors and present day use by tribal members.

Semi-primitive motorized recreation opportunities (see appendix 2-D for definition) are available in segment 2 (roaded natural recreation opportunities are available in segment 3). The major recreation activities in the study area include whitewater boating, fishing, hunting, and camping. Additional activities include sightseeing, hiking, photography, picnicking, wildlife observation, driving for pleasure, trapping, off-road vehicle use, and horseback riding.

Eligibility Determination. To be eligible for inclusion in the National Wild and Scenic Rivers System, a river or river segment must be free-flowing and must posses at least one outstandingly remarkable value (ORV). The definition of free-flowing and guidelines for what makes a resource outstandingly remarkable can be found in the Wild and Scenic River Eligibility and Classification Determinations section of this appendix. As mentioned previously and explained fully in the Final Eligibility and Suitability Report for the Upper Klamath Wild and Scenic River Study, segment 1 was determined ineligible for inclusion in the NWSRS. Segment 2 of the upper Klamath River is free-flowing (as is segment 3). The ORVs in segment 2 include recreation, wildlife, fish, prehistoric, historic, and scenic values, as well as Native American traditional use. More detailed information and references on the ORVs can be found in the final river study report.

Recreation. The outstandingly remarkable recreation value of the river is predominantly related to whitewater boating and fishing. The upper Klamath River offers a variety of high quality year-round whitewater boating opportunities for rafters, canoeists, and kayakers. It provides the only year-round Class III to V rapids (see definitions in table 2-E-10) in Oregon and northern California, attracting visitors from outside the region who are willing to travel long distances to experience a quality whitewater run. Segment 2 contains more rapids (52), ranging from Class I to V, than most other rivers of the western United States. The first half of segment 2 offers less-technical Class I to III opportunities, while the lower half offers highly technical whitewater boating with 10 Class I to II and 18 Class III to V rapids. The relatively short distance (five river miles) of the lower half of segment 2, combined with the quantity and classification of rapids, provides an experience not found on other rivers in Oregon and northern California. Most of the private boaters are from within the region, and most of the commercial rafting outfitters and their clients are from outside the region, primarily from the San Francisco Bay area and northern California. The Klamath River offers an excellent fishery for wild rainbow trout with a size and catch rate among the highest in the state, which attracts anglers from outside the region. There is nearly unlimited shoreline access. Currently, the upper Klamath River is one of two major rivers in the region that is open to trout angling year-round (with catch-and-release requirements from June 15 to September 30).

Wildlife. The combination of numerous wildlife populations and diverse habitats found in segment 2 of the upper Klamath River is not found elsewhere in the region and qualifies as an outstandingly remarkable resource. There are four federally listed threatened or endangered and two federal candidate category 2 species; nine state listed threatened, endangered, and/or sensitive species; and two Oregon Natural Heritage Database listed species known to occur and an additional six federal and state listed species potentially occurring within this part of the study area (see table 2-E-11).

Wildlife habitat within and surrounding this segment is of exceptionally high quality and diversity for the region. The riverine habitat is important to a wide variety of birds and mammals including bald eagles, osprey, ringtail, and river otters. The canyon provides a natural migration corridor for a variety of raptors and the extensive rimrock is important raptor nesting habitat. Five known prairie falcon nest sites, a historic peregrine falcon nest eyre, and the high potential for reoccupation or reintroduction of peregrine falcons exists in the canyon. Large live and dead conifers provide nesting and roosting habitat for bald eagles and osprey. Three active bald eagle nests and one active osprey nest are found in the canyon. Caves provide important nursery and roosting habitat for several species of bats, including a federal candidate category 2 species (Townsend's big-eared bat). The extensive oak forest and grasslands are important habitat to large numbers of wintering non-game birds, which provide an important avian prey base to migrating and resident raptors.

Fish. The highly productive (both in terms of high catch rates of fish up to 20 inches and reproduction rates) native wild rainbow trout population in segment 2 qualifies as an outstandingly remarkable resource. The Klamath River is one of three rivers in the region and one of only six in Oregon that is designated and managed by the Oregon Department of Fish and Wildlife as a wild rainbow trout fishery. These trout are a naturally spawning population that are genetically unique in being resistant to high pH values; their resistance to a lethal parasite and high summer water temperatures may also be a genetic trait. These inherent characteristics of the Klamath River have

Table 2-E-10. Whitewater Classification on the Upper Klamath River.

River Section	Number of Rapids				
	Class1[1]	Class II[1]	Class III[1]	Class IV[1]	Class V[1]
RM 220.1 - RM. 214.3 (Boat launch area to Caldera Rapid)	14	9	1	0	0
RM 214.3 - RM 209.3 (Caldera Rapid to state line)	1	9	13	3	2

[1]Rapids are given a difficulty rating of I to VI on the International Scale of River Difficulty, shown below.

CLASS I EASY
Moving water with a few riffles and small waves. Few or no obstructions.

CLASS II EASY TO MEDIUM
Rapids with waves up to three feet, and wide clear channels. Some maneuvering is required around obvious obstacles.

CLASS III MEDIUM TO MODERATELY DIFFICULT
Rapids with high irregular waves, narrow channels, rocks, and holes. Often requires complex maneuvering.

CLASS IV DIFFICULT TO VERY DIFFICULT
Long, turbulent rapids with powerful waves and holes. Many obstacles requiring precise, expert maneuvering. Scouting from shore is often necessary.

CLASS V EXTREMELY DIFFICULT
Long, technical, and very violent rapids with highly congested routes which nearly always must be scouted from shore. Dangerous drops, unstable eddies, irregular currents, and horrendous holes are often encountered. Requires experience, self-confidence, and good physical condition.

CLASS VI NEARLY IMPOSSIBLE AND EXTREMELY DANGEROUS
Difficulties of Class V carried to the extreme of navigability. Mishap could be hazardous to life. For teams of experts only, after close study and with all precautions taken. Generally considered unrunnable for commercial purposes.

Source: Headwaters Commercial Outfitters (1989 Brochure).

been lethal to non-native trout introduced into the river in the past. The Northwest Power Planning Council has designated the upper Klamath River as a Protected Area due to the wild rainbow trout population. The Lost River and shortnose suckers (both federal and state endangered species) and the Klamath largescale sucker (a federal candidate category 2 and state sensitive species) potentially inhabit this segment.

Prehistoric. The prehistoric resources in this segment have been determined to be outstandingly remarkable because of the abundance of sites and their regional interpretive value. A high density of prehistoric sites (40 sites) occurs within this 11 mile stretch of the river, demonstrating the intense use of the corridor by Native Americans. Sites include pit house villages; fishing, hunting, and gathering camps; a quarry site; and burial grounds, indicating year-round use of the canyon. The distribution of plant and animal resources of the region in general was such that extensive seasonal movement of people was usually required; therefore, the year-round use of the canyon is exceptional in the region. The wide range of artifacts recovered in the corridor shows that it was used at various times, possibly concurrently, by the Shasta Nation of northern California, the Modoc and Klamath tribes of the Klamath Basin, the Takelma of the upper Rogue River, and possibly the Pit River Indians of northeastern California. The findings raise interesting research questions concerning the timing of the territorial boundary fluctuations, trade relationships between the

Table 2-E-11. Threatened, Endangered, and State Sensitive Fish and Wildlife in the Upper Klamath River Corridor.

Species	Status: OR	Status: Federal	Type of Use	Source
Birds				
Bald Eagle	T	T	N	BLM
Peregrine Falcon	E	E	M,P	ODFW
Northern Goshawk	SS		S,P	ODFW
Northern Pygmy Owl	SS		R	ODFW
Acorn Woodpecker	SS		R	ODFW
Lewis' Woodpecker	SS	FS	R	ODFW
Pileated Woodpecker	SS		ID,P	BLM
Western Bluebird	SS		N	KF
Western Yellow-billed Cuckoo[1]	SS	3B	ID	Littlefield
Mammals				
Fisher	SS		R	KF
Ringtail	SS		R	KF
Townsend's Big-eared Bat	SS	C2	S	BLM
Wolverine[1]	T	C2	R	ODFW
Herptiles				
California Mountain Kingsnake	SS		R	St. John
Western Pond Turtle	SS	C2	R	St. John
Tailed Frog[1]	SS		R	St. John
Spotted Frog[1]	SS		R	St. John
Short-horned Lizard[1]	SS		R	St. John
Sharptail Snake[1]	SS		R	St. John
Fish				
Lost River Sucker	E	E	R	KF
Shortnose Sucker	E	E	R	KF
Klamath Largescale Sucker[1]	SS	C2	R	KF

[1]Species potentially within or near the study area

Abbreviations used in this table:
T = Threatened Species
E = Endangered Species
SS = State Sensitive Species
C2 = Federal Candidate Category 2 Species
N = Nester
P = Potential Nester
S = Seasonal
M = Migrant
R = Resident
ID = Insufficient Data
3B = Taxa which do not meet Endangered Species Act's legal definition of species; future investigation could lead to reevaluation of the listing qualifications.
KF = City of Klamath Falls, 1986
FS = U.S. Fish and Wildlife Service Sensitive Bird Species

tribes, and early use of the canyon. All of the sites are eligible for nomination to the National Register of Historic Places as an Archaeological District.

Historic. Historic sites in segment 2 are primarily associated with Topsy Road, a historic stagecoach/freight road that extends along 5.1 miles of the canyon. This road, completed in 1890, is an outstandingly remarkable example of an early stagecoach and freight road in its original form. Topsy Road is the only road into the Klamath Basin that was used on a year-round basis. The Way Station, an excellent example of a livery station associated with stage and freight travel, provided year-round services to travelers on the Topsy Road. The two-story log cabin used at this stopover is in good condition. The presence of this historic site, as well as other sites (Way Cemetery, Kerwin Ranch, Frain Ranch, and Topsy School) along the Topsy Road, serve to enhance the historical value of the road.

Scenic. The scenic value of the upper Klamath River Canyon has been classified as Scenic Quality Class A, the BLM's highest scenic classification. The outstandingly remarkable scenic value is predominantly due to unique landform, diverse vegetation, water, and lack of negative cultural modifications. The canyon represents a transition from a mountainous to desert landscape as it crosses the Cascade Range, creating the unusual, varied scenery. The steep-walled, layered basalt canyon is the predominant visual element in the region, as the walls of the canyon rise up to 1,000 feet above the river. It cuts across the southeastern corner of the surrounding plateau, exhibiting considerably more landform variety than the plateau. This is due to its steep canyon slopes with large rock outcroppings in the form of vertical basalt cliffs, talus slopes, and rock slides. Vegetative variety, predominantly ponderosa pine with some oak, is much more diverse than the surrounding plateau due to the variety of elevation aspects, and slopes. The canyon provides exceptional opportunities to view wildlife or wildflowers. The area's remoteness and steep topography provides visitors with uncrowded and natural aesthetic experiences. The Klamath River itself enhances the visual variety in the canyon; as it flows through the deep canyon, it changes from slack, slow-flowing water in the wider areas to a rushing torrent of whitewater cascading through narrow rocky walls. Negative cultural modifications, such as roads, powerlines, and developments, are not seen by the casual observer along the river (see discussion in the Classification Determination section of this assessment).

Native American Traditional Use. The traditional use of the canyon by Native Americans has been determined to be outstandingly remarkable based on statements by the Klamath Tribe and the Shasta Nation and supporting archaeological and ethnographic evidence that the canyon is sacred and of immeasurable spiritual significance. The spiritual importance of the canyon is associated with the river and canyon's physical environment, as well as ancestral and current use by tribal members. The other ORVs (recreation [fishing], wildlife, fish, prehistoric, historic, and scenic values) form the canyon's physical environment. Because spiritual power is invested in the environment, the preservation of these resources as a whole is vital to Native American religion. The canyon is used by members of two very distinct groups, the Klamath Tribe and the Shasta Nation, for such spiritual activities as vision quests, curing ceremonies, and spiritual preparation; and for cultural activities, including fishing, hunting, gathering, and education. The canyon was also used by ancestors of both groups for burial sites. These sites contribute to the spiritual significance of the canyon because they are places where spiritual leaders or individuals can prepare for specific religious and medicinal ceremonies or communicate with the Great Creator (Hall 1985).

Classification Determination. Classification is based on the degree of naturalness and extent of development of the river and its adjacent lands, as they exist at the time of the study, using four criteria: water quality, water resource development, shoreline development, and accessibility. A description of the criteria can be found in the Wild and Scenic River Eligibility and Classification Determinations section of this appendix. The upper Klamath River's highest potential classification is scenic, as shown in table 2-E-12. Segment 2 is relatively unpolluted, but federally-approved state water quality standards, set by the Oregon Department of Environmental Quality for water in the Klamath River, are occasionally not met. This is especially apparent during periods of low summer flow, when water quality upstream from the study area also does not meet federal standards. The water in the study area is of sufficient quality to support the ORVs. The Oregon Department of Environmental Quality is currently establishing total maximum daily loads for municipalities and industries discharging effluent into the Klamath River. Water quality in rivers classified as scenic or recreational is not required to continually meet or exceed federally approved state standards; therefore, current water quality does not affect its qualifications for inclusion in the National Wild and Scenic Rivers System (NWSRS).

Table 2-E-12. Potential Classification Summary for Upper Klamath River.

Activity	Wild	Scenic	Recrational
Water Quality	DM	M	M
Water Resources Development	M	M	M
Shoreline Development	DM	M	M
Accessibility	DM	M	M

Abbreviations used in this table:
M = Meets
DM = Does not meet

The upper Klamath River is free of any major impoundments, diversions, or other modifications of the waterway. The presence of impoundments above and/or below the segment (including those that regulate the flow regime through the segment, such as is the case with segment 2 of the upper Klamath River) will not by themselves render a river ineligible. There are many river segments in the NWSRS that are downstream from major dams, such as the Rogue River in Oregon and the lower Klamath River in California. Minor rock irrigation diversions (low rock walls that stretch from the shoreline to the center of the river channel and in some instances across the entire river) are the only water resources developments in this segment.

Shoreline developments include a raft launch area, semi-primitive campsite, several primitive campsites, and remnants of historic activities, which are visible, but not obvious, from the river. Buildings visible from the river include three duplexes and an electric power substation adjacent to the powerhouse, and a historic log cabin in the lower half of segment 2, which is partially screened from view. A U.S. Geological Survey gaging station, which includes a cable strung across the river, a cable car, and a small building that houses the measuring equipment, is visible along a short reach of the river. The river corridor flows through the Ward Pasture of the Edge Creek allotment (#102). Currently, the Ward Pasture is grazed in spring and early summer. A small substation is visible for a short reach of the river in the lower part of segment 2. No timber harvest has occurred in the corridor in the past ten years. However, timber harvest in the canyon has occurred and is visible, but not obvious, from the river. The river corridor would not be available for planned timber harvest during the life of the RMP, although salvage harvest would be allowed if necessary.

The main transportation route to the study area is via Highway 66 (Greensprings Highway), an east-west route between U.S. 97 and Interstate 5. The two main access roads to the river begin at Highway 66; Topsy Road generally parallels the east side of the river and John C. Boyle Powerhouse access road parallels the west side of the river. Picard Road from Dorris, California provides access to the Topsy Road from the southeast. The Topsy Road, an improved dirt road, travels high above the river in segment 2; streamside access from this road is available during much of the year at Frain Ranch in section 3, T. 41 S., R. 6 E. The graveled John C. Boyle Powerhouse access road parallels the west side of the river for the entire river segment; however, it is generally far above the river, is inconspicuous, and is rarely visible from the river. Access to the river on the west side is present at the powerhouse (RM 220.3), the BLM raft launch area (1/4-mile downstream from the powerhouse), the BLM campsite (RM 217), Frain Ranch (RM 215), 1/4-mile downstream from Frain Ranch, and across from the Salt Caves (RM 211.8). The powerhouse access road is generally passable year-round to approximately RM 213; below that it is only used seasonally due to snow and mud in the winter and spring. Other roads on the west side of the river include a seasonal dirt road that begins above the canyon rim and intersects the powerhouse access road at RM 211 and 209.5, and a seldom used jeep road that parallels the river between the powerhouse road and the river, between RM 216.3 and 215. None of the roads in the corridor cross the river. Primary uses of the roads are for recreational activities, such as whitewater boating, fishing, hunting, camping, driving for pleasure, and sightseeing; and for maintenance of the John C. Boyle hydroelectric project facilities.

Suitability Factors

Current Land Status and Use. The Klamath Falls Resource Area administers approximately 9 river frontage miles (on both sides of the river), which is 82 percent of the river frontage, and 4,959 acres of the corridor, which is 75 percent of the corridor, as shown in table 2-E-13.

Land in the Klamath River Canyon is used for energy generation and transmission, recreation, wildlife habitat management, range resources, and Native American traditional use. The study segment lies between two hydroelectric projects, John C. Boyle in Oregon and Copco in California. The John C. Boyle Powerhouse is just outside the northern end of the segment 2 river corridor boundary. Facilities associated with that hydroelectric project that are within the corridor include three duplexes occupied seasonally by employees of PP&L, a substation, a gaging station, and access

Table 2-E-13. Segment Ownership and Status Within the Upper Klamath River Corridor.

Ownership	Acres	Precent
BLM		
Public Domain	2,177	33
O&C Lands	2,782	42
State	120	2
Private		
Pacific Power and Light Co.	991	15
Weyerhaeuser Timber Co.	178	3
Private Individuals	366	5
Total	**6,614**	**100**

roads. A powerline from the substation at the powerhouse roughly parallels the river for all but approximately 2.5 miles in segment 2. Much of the powerline is in the river corridor, but it is well screened from the river by vegetation and topography. The City of Klamath Falls has an application filed with the Federal Energy Regulatory Commission (FERC) for the proposed Salt Caves hydroelectric project, which would be in the river corridor. Recreational use activities include whitewater boating, fishing, hunting, camping, sightseeing, hiking, photography, trapping, picnicking, wildlife observation, driving for pleasure, off-road vehicle use, and horseback riding. The canyon provides habitat that is used extensively for several species of fish and wildlife. The Edge Creek allotment, which extends far beyond the study area, is the only livestock grazing allotment in the corridor. The BLM manages approximately 3,820 acres of that allotment in the corridor, while 980 acres are managed by Pacific Power and Light (PP&L). The BLM and PP&L are working closely to manage this allotment similarly. Currently, the Ward Pasture (part of the Edge Creek allotment) is grazed in spring and early summer. A portion of the Pokegama Wild Horse Management Area lies within the corridor. The Pokegama Wild Horse Herd has been inventoried biannually since 1972 and numbers have ranged from 25 horses in 1972 to a high of 42 in 1988. Native Americans, including the Shasta, Modoc, Klamath, Takelma, and possibly the Pit River tribes, have used the Klamath River Canyon at one time or another for approximately 7,000 years, and this traditional use continues into the present. Today members of the Klamath Tribe and the Shasta Nation use the canyon for spiritual purposes, hunting, fishing, gathering, and other cultural activities.

Timber has not been harvested from the river corridor in over ten years and would not be available for planned timber harvest during the life of this plan, although salvage harvest would be allowed if necessary.

There are no existing mining claims or mineral leases in the river corridor. Klamath County has zoned the private lands in the study area for forestry.

Reasonable Foreseeable Uses of the Land and Water Which Would be Affected By Designation. Management guidelines and standards for land uses and management practices appropriate for river areas designated under the National Wild and Scenic Rivers Act are described in the first section of this appendix, called Management Guidelines and Standards for National Wild and Scenic Rivers.

Designation as a scenic river area would ensure the canyon would continue to be managed under VRM II objectives, which would indirectly enhance or maintain the user's recreational experience. Fish and wildlife habitat would be maintained or enhanced through the long-term protection that would occur as a result of designation. Livestock grazing carrying capacity (AUMs) would remain the same, but the season of use would decrease slightly. This change would occur regardless of designation. Increased management attention to the Pokegama Wild Horse Management Area, which could improve the habitat for the herd. The Native American traditional use would benefit the most from designation. The river area would be ensured long-term protection. The land and the river itself are spiritually significant to the Klamath Tribe. Protection of the Klamath River Canyon would allow for the continuation of important spiritual and cultural activities of the Native Americans.

If the river were designated as a recreational river area, BLM management would be similar in most respects to management without designation, but BLM's management presence would increase, diminishing inappropriate uses and thus enhancing the river segment's recreational use. A wider variety of uses and activities could occur under a recreational rather than a scenic designation and therefore a scenic designation would provide the best protection to the ORVs.

Designation as scenic would preclude major diversions, hydroelectric power facilities, water supply or flood control dams, or other major streambank modifi-

cations along the river. This would preclude the building of the proposed Salt Caves hydroelectric project. No other management activities that could affect any of the ORVs or free-flowing character of the river would be allowed on BLM-administered land.

Existing uses, such as recreation and livestock grazing, could continue in the corridor at current levels. Opportunities for solitude would decrease with increased recreational use in the canyon. Increased levels of any uses or activities on BLM-administered land would be curtailed if they could harm the ORVs or free-flowing character of the stream.

Hydroelectric and Other Water Diversion Potential. The City of Klamath Falls has an application filed with the Federal Energy Regulatory Commission (FERC) for the proposed Salt Caves hydroelectric project, which would be located within segment 2 of the upper Klamath River. The hydroelectric project would be very similar to the existing John C. Boyle project. A summary of the project and its impacts are described briefly in appendix 4-C. The FERC's May 1990 environmental impact statement describes alternative hydroelectric projects and their effects. The existence of the application and subsequent environmental impact statement indicates that there is very high potential for hydroelectric power and associated water diversion in segment 2. Because of this, the formula used for the other potentially suitable river segments was deemed unnecessary.

Effects on Outstandingly Remarkable Values (ORVs). Designation as a scenic river area would ensure the continuation of a variety of recreational opportunities in a high quality, semi-primitive setting. Compatible recreation facilities could be built to enhance the recreational experience. The populations of the various wildlife species would be maintained or enhanced by long-term protection of their habitats. Fish populations and habitats would be maintained by designation. Increased management attention in the canyon would maintain or enhance prehistoric and historic values, depending on the specific actions eventually specified in a river management plan. Designation would ensure long-term protection for the Scenic Quality Class A scenic resources through preservation of the VRM Class II management objectives, which are to retain the existing character of the landscape. Many land uses and activities could still occur, but not within sight of the river. Protection of the upper Klamath River and its ORVs would allow for the continuation of Native American spiritual and cultural activities in the canyon in a semi-primitive setting.

If the river were not designated, long-term protection of the upper Klamath River would not be guaranteed. If the proposed Salt Caves hydroelectric project were not built, the ORVs generally would be maintained. If the proposed Salt Caves project were built, the recreation, wildlife, prehistoric, and scenic values, as well as the Native American traditional use of the corridor could be diminished. The following discussion is excerpted from appendix 4-C, which is a summary of the FERC EIS (1990). The recreational value would be diminished because of the significant change in water flows and presence of project-associated structures in segment 2, both of which would affect the recreational experience and the recreational activity, especially fishing and whitewater boating. Wildlife habitat would be lost or modified on approximately 240 acres. A habitat management program and timing of construction activities have been proposed as mitigation. In the short term (for the life of the plan) wildlife values would be diminished to some degree. Habitat and population of native rainbow trout and shortnose and Lost River suckers would remain unchanged in the short term from construction and operation of the Salt Caves project; however, in the long term, the rainbow trout habitat and population would be enhanced while the sucker habitat and population would be minimally affected. Construction and operation of the Salt Caves project would diminish prehistoric values in the canyon by directly affecting six sites and indirectly affecting six other sites. Although some of those sites are lithic scatters in poor condition, one of the sites in good condition, known as Border Village, consists of 23 house pits, midden (refuse heap), shell fragments, and lithics (flakes from making arrowheads and spear points). This site has regional and national significance and is eligible for nomination to the National Register of Historic Places. Three sites that may be indirectly affected are also potentially eligible for nomination to the National Register. The historic values would not be affected by the hydroelectric project. Vegetation would be removed from approximately 250 acres during project construction; approximately 80 percent of the power conduit system would be buried and therefore would not be visible from the river; the buried conduit route would be visible due to the extensive cut and fill slope disturbance. All of these effects in combination would diminish the outstanding scenic value of the Klamath Canyon. No other proposed or anticipated activities are expected to significantly diminish the ORVs.

How the River Segment Would Be Managed if it Were Not Designated or if Designated at a Lower Classification. The upper Klamath River would be managed as an area of critical environmental concern (ACEC) and as a special recreation management area (SRMA) whether or not it were designated as a scenic river area. The outstandingly remarkable values would be afforded short-term, but not necessarily long-term, protection under ACEC designation. Management

restrictions associated with the ACEC designation would include the following. Off-road vehicle use would be limited to existing roads and trails; land in the ACEC would not be available for planned timber harvest, although salvage harvest would be permitted if necessary; livestock grazing would be unrestricted; and mineral leasing would be subject to a no surface occupancy stipulation. Management under the SRMA would not be any different or more restrictive than under the ACEC. The ACEC boundary, except that it begins where the concrete flume/forebay enters the canyon wall, approximately two river miles upstream from the John C. Boyle Powerhouse, and ends just below the state line to include the BLM raft take out. Segment 2 of the upper Klamath River (from the John C. Boyle Powerhouse to the state line and 1/4-mile from the normal high water mark of each bank) has been designated as a State Scenic Waterway as a result of a ballot measure passed by statewide vote in November 1988. A State Scenic Waterway is the state-level equivalent to a National Wild and Scenic River. Private lands and BLM-administered lands to the extent consistent with federal laws and regulations would follow policies described in the Oregon Administrative Rules (OAR 736-40-005 to 736-40-095). The Klamath River would be managed with standard riparian management area buffers to protect the riparian zone and fish habitat. Visual resource management Class II objectives would be followed.

If the river were designated as a recreational river area, BLM management would be similar to management without designation, but the administrative cost would be higher. Management actions would be less restrictive than those on a scenic river area, which could result in lesser degree of naturalness in the canyon. A description of guidelines and standards for land uses and management practices for scenic and recreational river areas and recreational river areas can be found in the first section of this appendix, called Management Guidelines and Standards for National Wild and Scenic Rivers.

Cost of Administration. The basic objective of federal river designation is to maintain the river's existing condition. Any actual or potential threat to an ORV, together with specific options to remove or mitigate that threat, can only be determined on a case-by-case basis. Because of variable river values, possible threats and protection mechanisms, estimated costs of mitigating that threat will be made in the river management plan required to be completed within three full fiscal years of designation. The largest costs usually are associated with potential actions on private lands within the corridor, where acquisition or other options can be necessary to remove the threat. If the Klamath River were designated under the NWSRA, no hydroelectric projects or major diversions would be allowed; therefore, such a project would not be considered a threat and no cost would be associated with removing or mitigating that threat.

The estimated cost of preparing a required river management plan for this stream segment would be approximately $150,000. Annual river management, administration, and monitoring costs are estimated to be approximately $10,000. Cost estimates for resource protection measures and necessary public use facilities would be determined through the river management planning process, which would occur after Congressional designation.

No state or local agency has come forward and stated they would be willing to share in the cost of administering this river segment should it become part of the system. In light of the financial constraints imposed by Oregon ballot Measure 5, it is unlikely that state or local agencies would share in these costs, even though the upper Klamath River is a state scenic waterway.

Administering Agency. If the upper Klamath River were added to the National Wild and Scenic Rivers System, the BLM would continue to manage the land and resources in the river corridor in cooperation with the Pacific Power and Light Company and the Oregon State Parks and Recreation Department, which is how it is currently managed.

Finding and Rationale

Finding. The 11.0-mile segment of the upper Klamath River from just below the John C. Boyle Powerhouse to the Oregon-California state line and from rim to rim is found suitable for federal designation as a scenic river area under the National Wild and Scenic Rivers Act.

Characteristics Which Do or Do Not Make the Area a Worthy Addition to the System. The outstandingly remarkable values (ORVs) discussed previously make the upper Klamath River a worthy addition to the National Wild and Scenic rivers System. The values that are either comparable to or more significant than those same values found on other designated rivers in the NWSRS are now described.

The upper Klamath River is one of only three rivers that crosses the Cascade Mountain range and represents a transition from mountainous to desert landscape. As a result, the scenery of the river compares with, and sometimes exceeds, that of the Rogue River's designated wild and scenic sections.

Native American traditional use, not represented by other rivers in the NWSRS is one of the upper Klamath River's most unique ORVs. At least two distinct groups

of Native Americans (the Klamath Tribe and the Shasta Nation) have continually used the river corridor for 7,000 years. Preservation of the river's ecosystem, as well as ancestral and current use by tribal members, predominantly for spiritual and cultural activities, are important aspects of Native American traditional use of the Klamath River Canyon.

The density of prehistoric sites, some dating back 7,000 years, is comparable with those found along the John Day River, which was added to the NWSRS in 1988.

The upper Klamath River is a classic example of a short, highly technical whitewater rafting run. It has more technical rapids (class IV and V) concentrated within a short stretch of river than either the Lower Klamath or Rogue rivers, the two closest designated rivers in the region that provide whitewater rafting (see table 2-E-10). Class IV andf V rapids can be experienced on the upper Klamath River in the late summer and early fall when the Owyhee and Illinois rivers are unrunnable because of low water and when access is limited on the Rogue River because of its very restrictive permit system. The Owyhee and Illinois rivers are two of only three other designated rivers in Oregon with class IV and V rapids.

Wild rainbow trout fishing on the upper Klamath River is rivaled in Oregon only by the Deschutes River, which is in the NWSRS.

Fifteen federal and state threatened or endangered and state sensitive species are found within the river corridor (see table 2-E-11). Four of these are federal threatened or endangered fish or wildlife species. Not other designated river in the region (Jackson, Josephine, Klamath, and most of Douglas counties) has this concentration of federal threatened or endangered species.

In addition to each individual value, the combination of the ORVs, each with exceptional significance and concentration within such a small area, causes the upper Klamath River and its ecosystem to be a unique contribution to the National system.

The study area is 75 percent managed by the BLM, which enhances the river's suitability for inclusion in the National Wild and Scenic Rivers System. The BLM has been working in close cooperation with PP&L, who owns 15 percent of the corridor.

Almost 1,100 comments were received on the Draft Eligibility and Suitability Report for the Upper Klamath Wild and Scenic River Study, published in 1989. Approximately 22 percent of the public comments on the Summary of the Analysis of the Management Situation, published in December 1990, that were received by the end of the comment period, and most of the comments received since then, have been in reference to potential designation of the upper Klamath River. This indicates public interest is high on this issue. The strongest feelings against designation were in letters from Klamath Falls; while the strongest feelings for designation were in letters from California and other states not including Oregon. In Oregon (excluding Klamath Falls), the sentiment was fairly evenly divided, but leaned slightly more toward designation.

Designation of the upper Klamath would not cause any change in existing employment figures, although it would preclude the additional employment and income that would be associated with the construction and operation of the Salt Caves hydroelectric project. Activities on private land would not be affected beyond that under the State Scenic Waterways Act. The greatest positive effect from designation as scenic would be the long-term protection of the ORVs within the river segment. The greatest negative effect would be the restriction on new land uses, developments, and activities that could, if allowed, negatively affect either the ORVs or the free-flowing character of the river.

Proposed Action for the Upper Klamath River in California

In 1990, three segments of the upper Klamath River totalling 20.5 miles were studied for their eligibility and suitability for inclusion in the National Wild and Scenic Rivers System. The Klamath Falls Resource Area Resource Management Plan/Environmental Impact Statement (RMP/EIS) reanalyzed the two segments in Oregon (15.2 miles), while the Redding BLM Draft RMP/EIS) discussed the 5.3-mile segment, which flows from the Oregon-California border to the backwater of Copco Reservoir in California (river mile 204). The proposed action from the Redding Draft RMP (March 1991) is as follows:

Management Area. Klamath

Alternative. Resource Use with Natural Values Consideration (proposed action)

Resource Condition Objectives. The resource condition objectives of the upper Klamath River are to maintain the visual quality of the river corridor; improve the condition of riparian vegetation to Class I; protect the cultural resources of the river corridor; and improve semi-primitive non-motorized recreation opportunities.

Land Use Allocations. The Klamath River is considered eligible for inclusion in the NWSRS. All public land in the corridor bounded by the northern canyon rim and within 1/4-mile of the normal high water mark along the southern bank would be managed in a manner that would not impair the outstandingly remarkable values and that would be consistent with a preliminary scenic classification. Management actions would meet VRM Class II objectives. The corridor would remain as semi-primitive motorized. Vehicle use would be limited to designated roads and trails. Livestock grazing would be prohibited.

The river corridor would be withdrawn from mineral entry. Public lands within the corridor would be offered for mineral leasing with a no surface occupancy stipulation. Mineral material disposals would not be allowed within the corridor.

Administrative transfer of four parcels totalling approximately 520 acres would be sought from the Klamath National Forest. Unimproved, privately-owned lands within the area would be acquired and/or cooperative management agreements with Pacific Power and Light would be developed.

Management Actions. The existing river management plan for the upper Klamath River above Copco Reservoir would be amended to reflect both the BLM Final Eligibility and Suitability Report for the Upper Klamath Wild and Scenic River Study (1990) and the recommendations of the Klamath Falls RMP/EIS.

Appendix 2-F
Land Tenure

Introduction

This appendix includes criteria to be used in evaluating land disposal or acquisition actions and a listing of public lands, by legal description, that may be suitable for sale, pending site-specific environmental analysis.

Land Ownership Adjustment Criteria

In accordance with the Federal Land Policy and Management Act of 1976 (FLPMA) and other laws, Executive Orders, and Departmental and Bureau policy the following criteria that would be used to evaluate opportunities for disposal or acquisition. This list is not considered all inclusive, but represents the major factors to be evaluated. They include:

- Threatened, endangered, or sensitive plant and animal species habitat;
- Riparian areas and wetlands;
- Nesting/breeding habitat for game and non-game animals;
- Key big game seasonal habitat;
- Developed recreation sites and recreation use areas;
- High quality scenery;
- Land adjacent to rivers eligible for designation under the National Wild and Scenic Rivers Act;
- Significant cultural resources and sites eligible for inclusion on the National Register of Historic Places;
- Designated wilderness areas and areas being studied for possible wilderness designation;
- Accessibility of the land for public recreation and other uses;
- Amount of public investments in facilities or improvements and the potential for recovering those investments;
- Difficulty or cost of administration (manageability);
- Suitability of the land for management by another federal agency;
- Significance of the decision in stabilizing business, social and economic conditions, and/or lifestyles;
- Whether private sites exist for the proposed use;
- Encumbrances, including but not limited to, withdrawals or existing leases or permits;
- Consistency with cooperative agreements and plans or policies of other agencies; and
- Suitability (need for change in land ownership or use) for purposes, including but not limited to, community expansion or economic development, such as industrial, residential, or agricultural (other than grazing) developments.

Zone 3 Lands

The following lands are potentialy suitable for disposal through sale under section 203(a) of FLPMA if important recreation, wildlife, watershed, threatened or endangered species habitat, and/or cultural values are not identified during disposal clearance reviews and no viable exchange proposals for them can be identified. These lands would also be available for transfer to another agency or to local governments, as needed, to accommodate community expansion and other public purposes.

Legal Description	Size (acres)
T. 41 S., R. 7 E.	
Sec. 13 - NENE	40.00
T. 38 S., R. 8 E.	
Sec. 31 - Lot 4	10.30
T. 39 S., R. 8 E.	
Sec. 6 - Lot 6	27.20
Sec. 7 - Lot 5	16.90
Sec. 33 - Lot 1,	4.42
the unpatented portion of	
T. 40 S., R. 8 E.	
Sec. 17 - SWSE	40.00
Sec. 21 - SWSE	40.00
Sec. 22 - Lot 4	38.00
Sec. 28 - SENE, WNE, NWSE	160.00

Appendix 2-F (cont.)

Legal Description	Size (acres)
T. 41 S., R. 8 E.	
Sec. 8 - NWNW, SN, ESW, SE	440.00
Sec. 17 - NENE	40.00
T. 37 S., R. 9 E.	
Sec. 3 - SENW, NESW	80.00
Sec. 4 - SWSW	40.00
Sec. 6 - SENW	40.00
Sec. 7 - NENE	40.00
Sec. 8 - ESW	80.00
Sec. 9 - NWNW, NESW	80.00
Sec. 13 - NESE, WW	200.00
Sec. 14 - NENE, SESE	80.00
Sec. 17 - WE, NENW	200.00
Sec. 20 - NNE, SENE	120.00
Sec. 21 - SWNW, NWSW, SESW	120.00
Sec. 28 - WNW, SWNE, NWSE, SESE	200.00
Sec. 35 - SENE	40.00
T. 38 S., R. 9 E.	
Sec. 3 - SENE, SESE	80.00
Sec. 5 - SWSE	40.00
Sec. 8 - NENE	40.00
Sec. 9 - NWNW, SESW	80.00
Sec. 15 - SWSW	40.00
T. 40 S., R. 9 E.	
Sec. 23 - SWNW	40.00
Sec. 35 - NNE, SENE	120.00
T. 37 S., R. 10 E.	
Sec. 12 - SSE	80.00
Sec. 13 - NENW	40.00
T. 38 S., R. 10 E.	
Sec. 6 - Lot 5	39.80
Lot 6	39.96
Lot 7	40.12
NESW	40.00
Sec. 7 - NENE, NENW	80.00
Sec. 35 - NESW	40.00
T. 39 S., R. 10 E.	
Sec. 10 - SSE	80.00
T. 37 S., R. 11 E.	
Sec. 15 - NWNW	40.00
Sec. 23 - NWNW, SESE	80.00
Sec. 29 - NSW, SESW	120.00
Sec. 30 - NSE	80.00
Sec. 33 - SENW, WSE	120.00

Appendix 2-F (cont.)

Legal Description	Size (acres)
T. 38 S., R. 11 E.	
Sec. 17 - NWNE, ESE	120.00
Sec. 32 - NESW, NWSE	80.00
T. 39 S., R. 11 E.	
Sec. 2 - Lot 1	40.24
T. 37 S., R. 11-1/2 E.	
Sec. 11 - NE, NSE	240.00
Sec. 13 - ENW	80.00
Sec. 14 - SENE	40.00
Sec. 17 - SESW	40.00
Sec. 20 - NESE	40.00
Sec. 21 - NWNE, SNE, NNW, NSE, SESE	320.00
Sec. 22 - WSW	80.00
Sec. 26 - NENW	40.00
Sec. 27 - NWSW	40.00
Sec. 28 - SWNE, WNW, SENW, NWSW	200.00
Sec. 29 - SENE, ESW, ESE	200.00
T. 39 S., R. 11-1/2 E.	
Sec. 9 - SENE	40.00
Sec. 10 - SWNW	40.00
Sec. 21 - NENE	40.00
T. 38 S., R. 12 E.	
Sec. 5 - WSW	80.00
Sec. 6 - NESE	40.00
T. 39 S., R. 12 E.	
Sec. 21 - NENE	40.00
Sec. 26 - NWSE, SESE	80.00
Sec. 28 - NESW	40.00
T. 40 S., R. 13 E.	
Sec. 35 - SWNE	40.00
T. 41 S., R. 13 E.	
Sec. 14 - NENW	40.00
T. 37 S., R. 13 E.	
Sec. 1 - Lot 5	9.88
Lot 7	9.88
Sec. 11 - NWSE	40.00
T. 37 S., R. 14 E.	
Sec. 10 - NWNE, NSWNE, NSSWNE	70.00
T. 41 S., R. 14 E.	
Sec. 5 - NESE	40.00

Appendix 2-G
Proposed Restrictions On Mineral And Energy Exploration And Development Activity

Introduction

This appendix discusses the leasing stipulations as they would be applied to BLM-administered lands in the planning area under each alternative. Operating standards pertinent to the locatable and salable minerals program are also described. Mineral exploration and development on Federal lands must also comply with laws and regulations administered by several agencies of the State of Oregon; however, these requirements are not discussed in this document.

Leasable Mineral Resources

Oil and Gas Leasing

The Mineral Leasing Act of 1920 (as amended) provides that all publicly owned oil and gas resources be open to leasing, unless a specific land order has been issued to close the area. Through the land use planning process, the availability of these resources for leasing is analyzed by taking into consideration development potential and surface resources. Restrictions on oil and gas operations are identified and placed in the leases as notices and stipulations. Oil and gas leases are then issued from the BLM Oregon State Office in Portland. Specific proposed notices and stipulations are listed by alternative later in this appendix.

The issuance of a lease conveys to the lessee an authorization to actively explore and/or develop the lease, in accordance with the attached stipulations and the standard terms outlined in the Federal Onshore Oil and Gas Leasing Reform Act (FOOGLRA). Restrictions on oil and gas activities in the planning area will take the form of timing limitations, controlled surface use, or no surface occupancy stipulations used at the discretion of the authorized officer (appropriate level BLM signing official) to protect identified surface resources of special concern.

Stipulations will be attached to each lease, before it is offered for sale, by the field office which reviews the lease tract. The review will be conducted by consulting the direction given in this resource management plan. In addition, all lands administered by the BLM within the planning area will be subject to the lease notices as shown on the following pages. Every attempt will be made to place stipulations in the lease and to minimize use of Standard Conditions of Approval attached to the site-specific permit. All federal lessees or operators are required to follow procedures set forth by: Onshore Oil and Gas Orders, Notices to Lessees, the Federal Oil and Gas Royalty Management Act (as amended), the Federal Onshore Oil and Gas Leasing Reform Act, and Title 43 Code of Federal Regulations, Part 3100.

Oil And Gas Operations

Geophysical Exploration

Geophysical operations may be conducted regardless of whether the land is leased or not. Notices to conduct geophysical operations on BLM surface are received by the resource area. Administration and surface protection are accomplished through close cooperation of the operator and the BLM. Seasonal restrictions may be imposed to reduce fire hazards, conflicts with wildlife, watershed damage, etc. An operator is required to file a *Notice of Intent to Conduct Oil and Gas Exploration Operations* for all geophysical activities on public land administered by the BLM. The notice should adequately show the location and access routes, anticipated surface damages, and time frame. The operator is required to comply with written instructions and orders given by the authorized officer, and must be bonded. Signing of the notice of intent by the operator signifies agreement to comply with the terms and conditions of the notice, regulations, and other requirements prescribed by the authorized officer. A pre-work conference and/or site inspection may be required. Periodic checks during and upon completion of the operations will be conducted to ensure compliance with the terms of notice of intent, including reclamation.

Drilling Permit Process

The federal lessee or operating company selects a drill site based on spacing requirements, subsurface and surface geology, geophysics, topography, and economic considerations. Well spacing is determined by the authorized officer after considering topography, reservoir characteristics, protection of correlative rights, potential for well interference, interference with multiple use of lands, and protection of the surface and subsurface environments. Close coordination with the State would take place. Written field spacing orders are issued for each field. Exceptions to spacing requirements involving federal lands may be granted after joint State and BLM review.

Notice of Staking

Once the company makes the decision to drill, they must decide whether to submit a notice of staking (NOS) or apply directly for a permit to drill. The NOS is an outline of what the company intends to do, including a location map and sketched site plan. The NOS is used to review any conflicts with known critical resource values and to identify the need for associated rights-of-way and special use permits. The BLM uses the information contained in the NOS and obtained from the on-site inspection to develop conditions of approval to be incorporated into the application for permit to drill. Upon receipt of the NOS, the BLM posts the document and pertinent information about the proposed well in the District Office for a minimum of 30 days prior to approval for review and comment by the public.

Application for Permit to Drill (APD)

The operator may or may not choose to submit a NOS; in either case, an application for permit to drill (APD) must be submitted prior to drilling. An APD consists of two main parts: a 12-point surface plan that describes any surface disturbances and is reviewed by resource specialists for adequacy with regard to lease stipulations designed to mitigate impacts to identified resource conflicts with the specific proposal, and an 8-point subsurface plan that details the drilling program and is reviewed by the staff petroleum engineer and geologist. This plan includes provisions for casing, cementing, well control, and other safety requirements. For the APD option, the on-site inspection is used to assess possible impacts and develop provisions to minimize these impacts. If the NOS option is not used, the 30 day posting period begins with the filing of the APD. Private surface owner input is actively solicited during the APD stage.

Geothermal Leasing

The Geothermal Steam Act of 1970 (as amended) provides for the issuance of leases for the development and use of geothermal steam and associated geothermal resources. Geothermal leasing and operational regulations are contained in Title 43 Code of Federal Regulations, Part 3200. Through the land use planning process the availability of the geothermal resources for leasing is analyzed, taking into consideration development potential and surface and subsurface resources. Restrictions on geothermal operations are identified and placed in the leases as stipulations. Geothermal leases are then issued by the BLM Oregon State Office in Portland.

Geothermal resources within a known geothermal resource area (KGRA) are offered by competitive sale. Outside of KGRAs, leases can be issued non-competitively (over-the-counter). Prior to a competitive lease sale, or the issuance of a non-competitive lease, each tract will be reviewed and appropriate lease stipulations will be included. The review will be conducted by consulting the direction given in this resource management plan. The issuance of a lease conveys to the lessee authorization to actively explore and/or develop the lease in accordance with regulations, lease terms, and attached stipulations. Subsequent lease operations must be conducted in accordance with the regulations, geothermal resources operational orders, and any conditions of approval developed as a result of site-specific National Environmental Policy Act (NEPA) analysis. In the planning area, restrictions in some areas will include timing limitations, controlled surface use, or no surface occupancy stipulations and used at the discretion of the Authorized Officer to protect identified surface resources of special concern.

In addition to restrictions related to the protection of surface resources, the various stipulations and conditions could contain requirements related to protection of subsurface resources. These requirements may involve drainage protection of geothermal zones, protection of aquifers from contamination, or assumption of responsibility for any unplugged wells on the lease.

Development of geothermal resources can be done only on approved leases. Orderly development of a geothermal resource from exploration to production involves several major phases that must be approved separately. Each phase must undergo the appropriate level of NEPA compliance before it is approved and subsequent authorization(s) are issued.

Leasing Notice And Stipulation Summary

On the following pages, the mineral leasing notices and stipulations are shown by planning alternative. The tracts of land to which these apply will, in many cases, differ by alternative. Those notices and stipulations shown as common for all alternatives are considered to be the minimum necessary in order to issue leases in the operating area. Under all alternatives, the standard leasing terms (Form 3100-11) alone would be used on most lands. The powersite stipulation (Form 3730-1) would be used on lands within powersite reservations. Lands under the jurisdiction of the Department of the Army Corps of Engineers would be leased subject to the stipulation on Form 3109-2.

Stipulations can also include waiver, exception, and modification criteria defined below. If the authorized officer determines that a stipulation involves an issue of major concern, waivers, exceptions, or modifications of the stipulation will be subject to at least a 30-day advance public review (43 CFR 3101.1-4). Waiver, exception, and modification are defined as follows:

- Waiver - The lifting of a stipulation from a lease which constitutes a permanent revocation of the stipulation from that time forward. The stipulation no longer applies anywhere within the leasehold.
- Exception - This is a one time lifting of the stipulation to allow a permitting activity for a specific proposal. This is a case-by-case exemption. The stipulation continues to apply to all other sites within the leasehold to which the restrictive criteria apply. It has no permanent effect on the lease stipulation.
- Modification - This is a change to a stipulation that either temporarily suspends the stipulation requirement or permanently lifts the application of the stipulation on a given portion of the lease. Depending on the specific modification, the stipulation may or may not apply to all other sites within the leasehold to which the restrictive criteria apply.

Throughout the alternatives, the no surface occupancy stipulation is used rather than denying a lease, because leasable minerals, if present, can be produced from most, if not all of each of the parcels that are subject to this stipulation without impacting the value(s) needing protection.

Whenever a special stipulation, such as no surface occupancy (NSO), timing, or controlled surface use (CSU) is used, the need for the special stipulation is described in the objective that follows the stipulation. By imposing these special stipulations, it has been concluded that less restrictive stipulations would not be adequate to meet the stated objective.

Leasing Notices

The following notices are to be issued with each lease for all lands administered by BLM within the planning area. Lease notices are attached to leases in the same manner as stipulations; however, there is an important distinction between lease notices and stipulations. Lease notices do not involve new restrictions or requirements. Any requirements contained in a lease notice must be fully supported by laws, regulations, policies, onshore oil and gas orders, or geothermal resources operational orders.

Leasing Notices & Stipulations by Alternative

Notices	NA	A	B	C	D	E	PA
Northern spotted owl nest sites	x	x	x	x	x	x	x
American peregrine falcon nest site	x	x	x	x	x	x	x
Threatened & Endangered plant/animal species	x	x	x	x	x	x	x
Cultural resources	x	x	x	x	x	x	x
Special Status plant species (all BLM land)	x						
Special Status plant species (public land)			x	x			
Special Status plant species (all BLM land)					x	x	

Leasing Notices & Stipulations by Alternative (cont.)

Stipulations	NA	A	B	C	D	E	PA
NSO[1] - Bly Sanitary Landfill	x	x	x	x	x	x	x
NSO - Recreation sites (developed)	x	x	x	x	x	x	x
NSO - Progeny test sites	x	x	x	x	x	x	x
NSO - Visual Resource Management Class I	x					x	
NSO - Native American religious sites	x	x	x	x	x	x	x
NSO - Special Recreation Management Area	x	x	x	x	x	x	x
NSO - Special Management Areas				x	x	x	x
NSO - Special Management Areas					x	x	
NSO - Areas of Critical Environmental Concern			x	x	x	x	x
NSO - Area of Critical Environmental Concern				x	x	x	
NSO - Areas of Critical Environmental Concern					x	x	
NSO - Research Natural Areas				x	x	x	x
NSO - Protected Habitat Area							x
Timing - Bald/Golden Eagle nest sites	x	x	x	x	x	x	x
Timing - Deer/Elk critical winter range	x	x	x	x	x	x	x
Timing - Osprey nest sites		x	x	x	x	x	x
Timing - Wetlands		x	x	x	x	x	x
Timing - Western sage grouse leks		x	x				
Timing - Western sage grouse leks				x	x		x
Timing - Western sage grouse leks						x	
CSU[2] - Soils/water	x	x	x	x	x	x	x
CSU - Visual Resource Management Class II	x	x	x	x	x	x	x
CSU - Off-road vehicle closures-wildlife	x			x	x	x	x
CSU - Off-road vehicle closures				x	x	x	x
CSU - Off-road vehicle closures					x	x	
CSU - Special Recreation Management Areas	x			x	x	x	x
CSU - Special Recreation Management Areas				x	x	x	x
CSU - Special Recreation Mgmt. Area					x	x	
CSU - Riparian Management Areas		x	x	x	x	x	x
CSU - Deer/elk roads in critical winter range				x	x	x	x
CSU - Seral Stage Diversity Blocks			x				
CSU - Old Growth Restoration & Retention Blocks				x			
CSU - Designated Conservation Area (spotted owl)					x		
CSU - Old forest — older than 150 yrs						x	
CSU - Protected Habitat Area Buffer							x
CSU - Suitable Scenic River	x				x	x	x
CSU - Suitable Scenic River						x	x
CSU - Suitable Scenic River						x	
CSU - Suitable Recreational River				x			

[1]No surface occupancy
[2]Controlled surface use

Leasing Notices Common To All Alternatives

Notice

Wildlife - northern spotted owl nest sites and nesting habitat

The leased lands are in an area suitable for the habitat of the northern spotted owl, *(Strix occidentalis caurina),* an animal species which is officially listed as a threatened species.

All viable habitat will be identified for the lessee/ operator by the authorized officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicates that the proposed activity may affect the species, then consultation will be conducted with the U.S. Fish & Wildlife Service pursuant to section 7 of the Endangered Species Act of 1973, as amended. The consultation will determine whether or not the proposed activity would jeopardize the continued existence of the species, and if so to what extent the proposed activity will be allowed.

Authority: The Endangered Species Act of 1973.

Notice

Wildlife - american peregrine falcon and nesting habitat

The leased lands are in an area suitable for the habitat of the american peregrine falcon *(Falco peregrinus anatum),* an animal species which is officially listed as an endangered species.

All viable habitat will be identified for the lessee/ operator by the authorized officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicates that the proposed activity may affect the species, then consultation will be conducted with the U.S. Fish & Wildlife Service pursuant to section 7 of the Endangered Species Act of 1973, as amended. The consultation will determine whether or not the proposed activity would jeopardize the continued existence of the species, and if so, to what extent the proposed activity will be allowed.

Authority: The Endangered Species Act of 1973.

Notice

Threatened and endangered plant and/or animal species

The leased lands are in an area suitable for the habitat of (common name), *(scientific name)* a(n) (plant/ animal) species which is (officially listed/proposed for listing) as a(n) (threatened/endangered) species.

All viable habitat will be identified for the lessee/ operator by the authorized officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicates that the proposed activity may affect the (officially listed/ proposed for listing) species, then (consultation/ conference) will be conducted with the U.S. Fish & Wildlife Service pursuant to section 7 of the Endangered Species Act of 1973, as amended. The (consultation/conference) will determine whether or not the proposed activity would jeopardize the continued existence of the species, and if so, to what extent the proposed activity will be allowed.

Authority: The Endangered Species Act of 1973

Notice

Cultural Resources-An inventory of the leased lands may be required prior to surface disturbance to determine if cultural resources are present and to identify needed mitigation measures. Prior to undertaking any surface-disturbing activities on the lands covered by this lease, the lessee or operator shall:

- Contact the Bureau of Land Management (BLM) to determine if a cultural resource inventory is required. If an inventory is required, then;
- The BLM will complete the required inventory; or the lessee or operator, at their option, may engage the services of a cultural resource consultant acceptable to the BLM to conduct a cultural resource inventory of the area of proposed surface disturbance. The operator may elect to inventory an area larger than the standard ten-acre minimum to cover possible site relocation which may result from environmental or other considerations. An acceptable inventory report is to be submitted to the BLM for review and approval no later than that time when an otherwise complete application for approval of drilling or subsequent surface-disturbing operation is submitted.
- Implement mitigation measures required by the BLM. Mitigation may include the relocation of proposed lease-related activities or other protective measures, such as data recovery and extensive recordation. Where impacts to cultural resources cannot be mitigated to the satisfaction of the BLM,

surface occupancy on that area must be prohibited. The lessee or operator shall immediately bring to the attention of the BLM, any cultural resources discovered as a result of approved operations under this lease, and shall not disturb such discoveries until directed to proceed by the BLM.

Authorities: Compliance with section 106 of the National Historic Preservation Act is required for all actions which may affect cultural properties eligible for the National Register of Historic Places. Compliance with the Archaeological Resources Protection Act and the Native American Graves Protection Act is also required. Section 6 of the Oil and Gas Lease Terms (Form 3100-11) requires that operations be conducted in a manner that minimizes adverse impacts to cultural and other resources.

Additional Leasing Notice Under The No Action Alternative

Notice

Special status plant species on all BLM-administered lands in planning area

The leased lands are in an area suitable for the habitat of (common name), *(scientific name)* plant species which is considered as a (Federal candidate/Bureau sensitive) species.

All viable habitat will be identified for the lessee/ operator by the authorized officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicates that the proposed activity may affect the species, then BLM policy directs that technical assistance be obtained from the U.S. Fish & Wildlife Service to insure that actions will not increase the need to list the species as threatened or endangered.

Authority: BLM Manual 6840 and BLM Instruction Memorandum OR-91-57.

Additional Leasing Notice For Alternatives B And C

Notice

Special status plant species on public lands

The leased lands are in an area suitable for the habitat of (common name), *(scientific name)* plant species which is considered as a (Federal candidate/Bureau sensitive) species.

All viable habitat will be identified for the lessee/ operator by the authorized officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicates that the proposed activity may affect the species, then BLM policy directs that technical assistance be obtained from the U.S. Fish & Wildlife Service to insure that actions will not increase the need to list the species as threatened or endangered.

Authority: BLM Manual 6840 and BLM Instruction Memorandum OR-91-57.

Additional Leasing Notice For Alternatives D And E

Notice

Special status plant species on all BLM-administered lands in planning area

The leased lands are in an area suitable for the habitat of (common name), *(scientific name)* plant species which is considered as a (Federal candidate/Bureau sensitive) species.

All viable habitat will be identified for the lessee/ operator by the authorized officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicates that the proposed activity may affect the species, then BLM policy directs that technical assistance be obtained from the U.S. Fish & Wildlife Service to insure that actions will not increase the need to list the species as threatened or endangered.

Authority: BLM Manual 6840 and BLM Instruction Memorandum OR-91-57.

Leasing Stipulations

Standard Leasing Terms

Standard leasing terms for oil and gas are listed in section 6 of Offer to Lease and Lease for Oil and Gas Form 3100-11. They are:

- Lessee shall conduct operations in a manner that minimizes adverse impacts to the land, air, and water; to cultural, biological, visual, and other resources; and to other land uses or users. Lessee shall take reasonable measures deemed necessary by lessor to accomplish the intent of this section. To the extent consistent with lease rights granted, such measures may include, but are not limited to,

modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures. Lessor reserves the right to continue existing uses and to authorize future uses upon or in the leased lands, including the approval of easements or rights-of-way. Such uses shall be conditioned so as to prevent unnecessary or unreasonable interference with rights of lessee.

- Prior to disturbing the surface of the leased lands, lessee shall contact BLM to be apprised of procedures to be followed and modifications or reclamation measures that may be necessary. Areas to be disturbed may require inventories or special studies to determine the extent of impacts to other resources. Lessee may be required to complete minor inventories or short-term special studies under guidelines provided by lessor. If, in the conduct of operations, threatened or endangered species, objects of historic or scientific interest, or substantial unanticipated environmental effects are observed, lessee shall immediately contact lessor. Lessee shall cease any operations that would result in the destruction of such species or objects until appropriate steps have been taken to protect the site or recover the resources, as determined by BLM in consultation with other appropriate agencies.

Standard terms for geothermal leasing can be found in the offer to lease and lease for geothermal resources (Form 3200-24), section 6, and are very similar to those described above for oil and gas leasing.

Powersite Stipulation (Form No. 3730-1) (to be used on all lands within powersite reservations.)

Special Leasing Stipulations

The following special stipulations are to be used on specifically designated tracts of land as described under the various alternatives.

Leasing Stipulations Common To All Alternatives

Controlled Surface Use

Resource: Soils and Water

Stipulation: Prior to disturbance of slopes over 60 percent, an engineering/reclamation plan must be approved by the authorized officer. Such plan must demonstrate how the following will be accomplished:

- Site productivity will be restored.
- Surface runoff will be adequately controlled.
- Off-site areas will be protected from accelerated erosion, such as rilling, gullying, piping, and mass wasting.
- Water quality and quantity will be in conformance with state and federal water quality laws.
- Surface-disturbing activities will not be conducted during extended wet periods.
- Construction will not be allowed when soils are frozen.

Objective: To maintain soil productivity, provide necessary protection to prevent excessive soil erosion on steep slopes, and to avoid areas having excessive reclamation problems.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that the impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that slopes over 60 percent in the area are not subject to excessive erosion and do not have excessive reclamation problems.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the entire leasehold does not include slopes over 60 percent.

No Surface Occupancy

Resource: Bly sanitary landfill

Stipulation: Surface occupancy and use is prohibited on the Bly sanitary landfill by the Recreation and Public Purposes Act (R&PP) lease.

Objective: To protect uses on the existing R&PP lease.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The area affected by this stipulation may be modified by the authorized officer if the land use authorization boundaries are modified.

Waiver: This stipulation may be waived by the authorized officer if all land use authorizations within the leasehold have been terminated, canceled, or relinquished.

No Surface Occupancy

A 30-day public notice period may be required prior to exception, modification, or waiver of this stipulation.

Resource: Recreation sites (Gerber, Topsy, Surveyor Mountain, Klamath River rafting put-in).

Stipulation: Surface occupancy and use is prohibited within developed recreation sites.

Objective: To protect developed recreation sites.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The boundaries of the stipulated area may be modified by the authorized officer if the recreation site boundaries are changed.

Waiver: This stipulation may be waived if the authorized officer determines that the entire leasehold no longer contains developed recreation areas.

No Surface Occupancy

Resource: Progeny test sites (Cold-Johnson, Long Point, Buck Swamp, Gerber Road, and North Willow Spring)

Stipulation: Surface occupancy and use is prohibited within progeny test sites.

Objective: To protect progeny test sites.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan demonstrating that the impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The boundaries of the stipulated area may be modified by the authorized officer if the progeny test site boundaries are changed.

Waiver: This stipulation may be waived if the authorized officer determines that the entire leasehold no longer contains progeny test sites.

Controlled Surface Use

Resource: Visual resource management (VRM) Class II

Stipulation: All surface-disturbing activities and semi-permanent and permanent facilities in VRM Class II areas may require special designs, including location, painting, and camouflage to blend with the natural surroundings and meet the visual quality objectives for the area.

Objective: To control the visual impacts of activities and facilities within acceptable levels.

Exception: None.

Modification: None.

Waiver: This stipulation may be waived if the authorized officer determines that there are no longer VRM Class II areas in the leasehold.

Timing Limitation

Resource: Wildlife - bald and golden eagle nest sites and nesting habitat

Stipulation: Surface occupancy and use is prohibited from January 1 to August 15, within 1/4 mile of known bald and golden eagle nest sites and nesting habitat.

Objective: To protect bald and golden eagle nesting sites and/or nesting habitat.

Exception: An exception may be granted by the authorized officer if the operator submits a plan which demonstrates that the proposed action will not affect the bald or golden eagle or its habitat. If the authorized officer determines that the action may or will have an adverse effect on the species, the operator may submit a plan demonstrating that the impacts can be mitigated adequately. This plan must be approved by BLM in consultation with the U.S. Fish and Wildlife Service (USFWS).

Modification: The boundaries of the stipulated area may be modified if the authorized officer, in consultation with USFWS, determines that portion of the area can be occupied without adversely affecting bald or golden eagle nest sites or nesting habitat.

Waiver: This stipulation may be waived if the authorized officer, in consultation with USFWS, determines that the entire leasehold can be occupied without adversely affecting bald or golden eagle nest sites or nesting habitat, or if the bald eagle is declared recovered and is no longer protected.

No Surface Occupancy

Resource: Native American religious sites

Stipulation: Surface occupancy and use is prohibited within the Yainax Butte and Olene Native American religious sites.

Objective: To protect important Native American religious sites.

Exception: An exception to this stipulation may be granted by the authorized officer if, after consultation with the appropriate tribe(s), it has been determined that the proposed action is compatible with the religious use of the site.

Modification: The boundaries of the stipulated area may be modified by the authorized officer if the religious site boundaries are changed by the appropriate tribe(s).

Waiver: This stipulation may be waived if the religious sites are abandoned and if, after consultation with the appropriate tribe(s), it is determined that impacts from subsequent surface occupancy are acceptable or can be mitigated adequately.

No Surface Occupancy

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Pacific Crest National Scenic Trail special recreation management area (SRMA)

Stipulation: Surface occupancy and use is prohibited within 50 feet of the Pacific Crest National Scenic Trail.

Objective: To protect recreational qualities, including scenery, and enhance recreational opportunities.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area no longer are suitable for inclusion in the SRMA.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the leased lands no longer qualify for SRMA designation.

Additional Leasing Stipulations For The No Action Alternative, Alternatives C Through E, And The Preferred Alternative

Timing Limitation

Consultation with the Oregon Department of Fish and Wildlife will be required prior to exception, modification, or waiver of this stipulation.

Resource: Wildlife-critical deer/elk winter range

Stipulation: Surface use is prohibited from November 20 to April 15 within critical deer/elk winter range. This stipulation does not apply to the operation or maintenance of production facilities.

Objective: To protect critical deer/elk winter range from disturbance during the winter use season, and to facilitate long-term maintenance of deer/elk populations.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The boundaries of the stipulated area may be modified if the authorized officer determines that portions of the area no longer contains critical winter range. This stipulation can be expanded to cover additional portions of the lease if additional critical habitat areas are identified, or if habitat use areas change. The dates for the timing restriction may be modified if new wildlife use information indicates that the November 20 to April 15 dates are not valid for the leasehold.

Waiver: This stipulation may be waived if the authorized officer determines that the entire leasehold no longer contains critical winter range for deer/elk.

Controlled Surface Use

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Klamath River Complex special recreation management area (SRMA)

Stipulation: Drill site construction and access within the Klamath River Complex SRMA will be limited to established roadways.

Objective: To protect recreational qualities and enhance recreational opportunities.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area no longer are suitable for inclusion in the SRMA.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the leased lands no longer qualify for SRMA designation.

Controlled Surface Use

Resource: Lower Klamath Hills wildlife area

Stipulation: Access, travel, and drill site construction will be limited to established roads.

Objective: To protect important wildlife habitat.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The boundaries of the stipulated area may be modified if the authorized officer determines that portions of the area can be occupied without adversely affecting the wildlife habitat.

Waiver: This stipulation may be waived if the area is no longer considered to contain important wildlife habitat.

Additional Leasing Stipulation For The No Action Alternative, Alternatives D And E, And The Preferred Alternative

Controlled Surface Use

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Upper Klamath River - segment 2 - suitable scenic river

Stipulation: Exploration activities, including drilling and access, within _ mile of the normal high water mark on each side of the river or from rim to rim, whichever is greater, will be limited to established roadways.

Objective: To minimize surface disturbance, water sedimentation and pollution, and visual impairment.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area no longer are suitable for designation as scenic.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the leased lands no longer contain a river designated as scenic.

Additional Leasing Stipulation For The No Action Alternative And Alternative E

No Surface Occupancy

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Visual resource management (VRM) Class I

Stipulation: Surface occupancy and use is prohibited in VRM Class I areas.

Objective: To preserve the existing character of the landscape.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The boundaries of the stipulated area may be modified by the authorized officer if the boundaries of the VRM Class I area are changed.

Waiver: This stipulation may be waived by the authorized officer if all VRM Class I areas within the leasehold are reduced to a lower VRM class. Areas reduced to a VRM Class II will be subject to the controlled surface use stipulation for visual resources, and areas reduced to VRM Class III will be subject to standard stipulations.

Additional Leasing Stipulations For Alternatives A Through E And The Preferred Alternative

Timing Limitation

Consultation with the Oregon Department of Fish and Wildlife will be required prior to exception, modification or waiver of this stipulation.

Resource: Wildlife - osprey nest sites

Stipulation: Surface occupancy and use is prohibited from May 1 to August 1, within _ mile of known osprey nest sites.

Objective: To protect osprey nest sites.

Exception: An exception may be granted by the authorized officer if the operator submits a plan which demonstrates that the proposed action will not affect the osprey or its nest site.

Modification: The boundaries of the stipulated area may be modified if the authorized officer determines that a portion of the area can be occupied without adversely affecting the osprey or its nest site.

Waiver: This stipulation may be waived if the authorized officer determines that there is no longer osprey nesting habitat on the leasehold.

Timing Limitation

Resource: Wetlands (See table 3-16 in chapter 3 for legal descriptions)

Stipulation: Surface occupancy and use is prohibited from November 1 to July 15, on wetlands.

Objective: To protect wetland vegetation and wildlife habitat

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: This stipulation may be modified if the authorized officers determines, on a wetland by wetland basis, that a shorter time limitation will adequately protect the wetland values.

Waiver: This stipulation may be waived if it is determined that the leasehold no longer contains wetland values.

Controlled Surface Use

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Riparian management areas (RMAs)

Stipulation: Unless otherwise authorized, drill site construction and access through RMAs within this leasehold will be limited to established roadways.

Objective: To protect riparian vegetation and reduce erosion adjacent to water courses.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: This stipulation may be modified if it is determined by the authorized officer that there is no threat to riparian values.

Waiver: This stipulation may be waived if it is determined by the authorized officer that there is no threat to riparian values.

Additional Leasing Stipulations For Alternatives B Through E And The Preferred Alternative

No Surface Occupancy

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Upper Klamath River area of critical environmental concern (ACEC)

Stipulation: Surface occupancy and use is prohibited within the Upper Klamath River ACEC.

Objective: To protect historic, cultural, scenic, fisheries, and wildlife resources.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The boundaries of the stipulated area may be modified if the ACEC boundaries are modified.

Waiver: This stipulation may be waived if the ACEC designation is lifted.

No Surface Occupancy

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Miller Creek area of critical environmental concern (ACEC)

Stipulation: Surface occupancy and use is prohibited within the Miller Creek ACEC.

Objective: To protect scenic values, wildlife resources, and natural processes.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The boundaries of the stipulated area may be modified if the ACEC boundaries are modified.

Waiver: This stipulation may be waived if the ACEC designation is lifted.

No Surface Occupancy

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Yainax Butte area of critical environmental concern (ACEC)

Stipulation: Surface occupancy and use is prohibited within the Yainax Butte ACEC.

Objective: To protect natural systems.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The boundaries of the stipulated area may be modified if the ACEC boundaries are modified.

Waiver: This stipulation may be waived if the ACEC designation is lifted.

recreation management area designation.

Additional Leasing Stipulations For Alternatives C Through E And The Preferred Alternative

Controlled Surface Use

Consultation with the Oregon Department of Fish and Wildlife will be required prior to exception, modification, or waiver of this stipulation.

Resource: Critical deer/elk winter range

Stipulation: New connecting or through roads in critical deer/elk winter range will not be allowed.

Objective: To protect critical deer/elk winter habitat

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can mitigated adequately.

Modification: A portion or portions of the leased lands can be opened to connecting or through roads if the authorized officer determines the area is no longer effective as habitat and is not used as winter range. This stipulation can be expanded to cover additional portions of the lease if additional critical habitat areas are identified, or if habitat use areas change.

Waiver: This stipulation can be waived if the habitat is no longer effective and is not used as winter habitat anywhere within the leasehold.

Controlled Surface Use

Resource: Stukel Mountain special recreation management area (SRMA)

Stipulation: Drill site construction and access within the Stukel Mountain SRMA will be limited to established roadways.

Objective: To protect recreational qualities and enhance recreational opportunities.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area no longer are suitable for inclusion in the SRMA.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the leased lands no longer qualify for SRMA designation.

Controlled Surface Use

Resource: Spencer Creek off-road vehicle closure

Stipulation: Access, travel, and drill site construction will be limited to established roads.

Objective: To protect important scenic, fisheries, and riparian resources.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The boundaries of the stipulated area may be modified if the authorized officer determines that portions of the area can be occupied without adversely affecting the resource values.

Waiver: None

No Surface Occupancy

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Clover Creek educational area

Stipulation: Surface occupancy and use is prohibited within the Clover Creek educational area.

Objective: To protect an educationally-important natural forest stand.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: This stipulation may be modified if the boundaries of the educational area change, or portions of the educational area can be used without adverse, unmitigable impacts.

Waiver: This stipulation may be waived if it is determined that the leasehold no longer contains important forest-related educational opportunities.

No Surface Occupancy

Resource: Surveyor Forest area

Stipulation: Surface occupancy and use is prohibited within the Surveyor Forest special management area.

Objective: To protect natural processes, scenic and wildlife resources, and educational opportunities.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: This stipulation may be modified if the boundaries of the special management area change, or portions of the area can be used without adverse, unmitigable impacts.

Waiver: This stipulation may be waived if it is determined that the leasehold no longer contains land that meets special management area criteria.

No Surface Occupancy

Resource: Bumpheads special management area

Stipulation: Surface occupancy and use is prohibited within the Bumpheads special management area.

Objective: To protect geologic values, scenic values, and natural systems.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: This stipulation may be modified if the boundaries of the special management area change, or portions of the area can be used without adverse, unmitigable impacts.

Waiver: This stipulation may be waived if it is determined that the leasehold no longer contains land that meets special management area criteria.

No Surface Occupancy

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Old Baldy research natural area (RNA)

Stipulation: Surface occupancy and use is prohibited within the Old Baldy RNA.

Objective: To protect scenic resources and natural processes.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: This stipulation may be modified if the boundaries of the research natural area change, or portions of the area can be used without adverse, unmitigable impacts.

Waiver: This stipulation may be waived if it is determined that the leasehold no longer contains land that meets research natural area criteria.

Controlled Surface Use

Resource: Swan Lake Rim roads

Stipulation: Access, travel, and drill site construction will be limited to established roads on the Swan Lake Rim.

Objective: To protect important scenic and wildlife resources, and to enhance recreational opportunities.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The boundaries of the stipulated area may be modified if the authorized officer determines that portions of the area can be occupied without adversely affecting the resource values.

Waiver: This stipulation may be waived if the off-road vehicle restriction is no longer needed.

Additional Leasing Stipulation For Alternatives A And B

Timing Limitation

Consultation with the Oregon Department of Fish and Wildlife will be required prior to exception, modification, or waiver of this stipulation.

Resource: Wildlife - western sage grouse lek sites

Stipulation: Surface occupancy and use is prohibited from March 1 to May 1 within 1/8 mile of known western sage grouse lek sites.

Objective: To protect lek sites.

Exception: An exception may be granted by the authorized officer if the operator submits a plan which demonstrates that the proposed action will not affect the sage grouse or its lek site.

Modification: The boundaries of the stipulated area may be modified if the authorized officer determines that a portion of the area can be occupied without adversely affecting the sage grouse or its lek site.

Waiver: This stipulation may be waived if the authorized officer determines that there is no longer a lek site on the leasehold.

Additional Leasing Stipulation For Alternative B

Controlled Surface Use

Resource: Seral stage diversity blocks

Stipulation: Unless otherwise authorized, drill site construction and access through seral stage diversity blocks within this leasehold will be limited to established roadways.

Objective: To protect vegetation and retain and/or restore older forests and seral stage diversity.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area do not include seral stage diversity blocks.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the entire leasehold no longer includes seral stage diversity blocks.

Additional Leasing Stipulations For Alternative C

Controlled Surface Use

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Old growth restoration and retention blocks

Stipulation: Unless otherwise authorized, drill site construction and access through old growth restoration and retention blocks within this leasehold will be limited to established roadways.

Objective: To retain and/or restore old growth forest and habitat diversity.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area do not include old growth restoration and retention blocks.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the entire leasehold no longer includes old growth restoration and retention blocks.

Controlled Surface Use

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Upper Klamath River - segment 2 - suitable recreational river

Stipulation: Exploration activities, including drilling and access, within _ mile of the normal high water mark on each side of the river or from rim to rim, whichever is greater, will be limited to established roadways.

Objective: To minimize surface disturbance, water sedimentation and pollution, and visual impairment.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area no longer are suitable for designation as recreational.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the leased lands no longer contain a river designated as recreational.

Additional Leasing Stipulation For Alternatives C, D, And E

No Surface Occupancy

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Pacific Crest area of critical environmental concern (ACEC)

Stipulation: Surface occupancy and use is prohibited within the Pacific Crest ACEC.

Objective: To protect recreational qualities, including scenery, and enhance recreational opportunities.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area no longer are suitable for inclusion in ACEC.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the leased lands no longer qualify as an ACEC.

Additional Leasing Stipulation For Alternatives C, D, And the Preferred Alternative

Timing Limitation

Consultation with the Oregon Department of Fish and Wildlife will be required prior to exception, modification, or waiver of this stipulation.

Resource: Wildlife - western sage grouse lek sites

Stipulation: Surface occupancy and use is prohibited from March 1 to May 1 within _ mile of known western sage grouse lek sites.

Objective: To protect lek sites.

Exception: An exception may be granted by the authorized officer if the operator submits a plan which demonstrates that the proposed action will not affect the sage grouse or its lek site.

Modification: The boundaries of the stipulated area may be modified if the authorized officer determines that a portion of the area can be occupied without adversely affecting the sage grouse or its lek site.

Waiver: This stipulation may be waived if the authorized officer determines that there is no longer a lek site on the leasehold.

Additional Leasing Stipulation For Alternative D

Controlled Surface Use

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Designated conservation areas (DCAs) for the northern spotted owl.

Stipulation: Unless otherwise authorized, drill site construction and access through DCAs within this leasehold will be limited to established roadways.

Objective: To protect habitat of the northern spotted owl.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area do not include DCAs.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the entire leasehold does not include DCAs.

Additional Leasing Stipulations For Alternatives D And E

No Surface Occupancy

Resource: Alkali Lake special management area

Stipulation: Surface occupancy and use is prohibited within the Alkali Lake special management area.

Objective: To protect wetlands and wildlife habitat.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: This stipulation may be modified if the authorized officers determines that climatic, soil, and moisture conditions are such that seasonal occupancy may be permitted.

Waiver: This stipulation may be waived if it is determined that the leasehold no longer contains wetland values.

No Surface Occupancy

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Spencer Creek area of critical environmental concern (ACEC)

Stipulation: Surface occupancy and use is prohibited within 100 feet of the Spencer Creek ACEC.

Objective: To protect an important fisheries.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area no longer are suitable for inclusion in the ACEC, and water quality will not be impacted.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the leased lands no longer qualify for designation as an ACEC, and water quality will not be impacted.

No Surface Occupancy

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Tunnel Creek Wetlands area of critical environmental concern (ACEC)

Stipulation: Surface occupancy and use is prohibited within the Tunnel Creek Wetlands ACEC.

Objective: To protect natural processes and riparian and wildlife resources.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: This stipulation may be modified if the authorized officers determines that climatic, soil, and moisture conditions are such that seasonal occupancy may be permitted.

Waiver: This stipulation may be waived if it is determined that the leasehold no longer contains wetland values.

Controlled Surface Use

Resource: Hamaker Mountain off-road vehicle (ORV) closure

Stipulation: Access, travel, and drill site construction will be limited to established roads in the Hamaker Mountain ORV closure.

Objective: To protect important scenic and wildlife resources, and to enhance recreational opportunities.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The boundaries of the stipulated area may be modified if the authorized officer determines that portions of the area can be occupied without adversely affecting the resource values.

Waiver: This stipulation may be waived if the ORV closure is lifted.

Controlled Surface Use

Resource: Stukel Mountain off-road vehicle (ORV) closure

Stipulation: Access, travel, and drill site construction will be limited to established roads in the Stukel Mountain ORV closure.

Objective: To protect important scenic and wildlife resources, and to enhance recreational opportunities.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The boundaries of the stipulated area may be modified if the authorized officer determines that portions of the area can be occupied without adversely affecting the resource values.

Waiver: This stipulation may be waived if the ORV closure is lifted.

Controlled Surface Use

Resource: Bryant Mountain special recreation management area (SRMA)

Stipulation: Access, travel, and drill site construction will be limited to established roads in the Bryant Mountain SRMA.

Objective: To protect important scenic and wildlife resources, and to enhance recreational opportunities.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The boundaries of the stipulated area may be modified if the authorized officer determines that portions of the area can be occupied without adversely affecting the resource values.

Waiver: This stipulation may be waived if the ORV restrictions are lifted.

Controlled Surface Use

Resource: Gerber Block roads

Stipulation: Access, travel, and drill site construction will be limited to established roads in the Gerber Block.

Objective: To protect important scenic and wildlife resources, and to enhance recreational opportunities.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The boundaries of the stipulated area may be modified if the authorized officer determines that portions of the area can be occupied without adversely affecting the resource values.

Waiver: This stipulation may be waived if the ORV restrictions are lifted.

Additional Leasing Stipulation For Alternative E And The Preferred Alternative

Controlled Surface Use

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Miller Creek - suitable scenic river

Stipulation: Exploration activities, including drilling and access, within _ mile of the normal high water mark on each side of the creek will be limited to established roadways.

Objective: To minimize surface disturbance, water sedimentation and pollution, and visual impairment.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area no longer are suitable for designation as scenic.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the leased lands no longer contain a river designated as scenic.

Additional Leasing Stipulations For Alternative E

Controlled Surface Use

Resource: Forest stands older than 150 years

Stipulation: Unless otherwise authorized, drill site construction and access through forest stands older than 150 years within this leasehold will be limited to established roadways.

Objective: To protect older forest stands.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that potions of the area no longer include old forest stands.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the entire leasehold no longer includes old forest stands.

Timing Limitation

Consultation with the Oregon Department of Fish and Wildlife will be required prior to exception, modification, or waiver of this stipulation.

Resource: Wildlife - western sage grouse lek sites

Stipulation: Surface occupancy and use is prohibited from March 1 to May 1 within 1/2 mile of known western sage grouse lek sites.

Objective: To protect lek sites.

Exception: An exception may be granted by the authorized officer if the operator submits a plan which demonstrates that the proposed action will not affect the sage grouse or its lek site.

Modification: The boundaries of the stipulated area may be modified if the authorized officer determines that a portion of the area can be occupied without adversely affecting the sage grouse or its lek site.

Waiver: This stipulation may be waived if the authorized officer determines that there is no longer a lek site on the leasehold.

Controlled Surface Use

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Barnes Valley Creek - suitable scenic river

Stipulation: Exploration activities, including drilling and access, within _ mile of the normal high water mark on each side of the creek will be limited to established roadways.

Objective: To minimize surface disturbance, water sedimentation and pollution, and visual impairment.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area are no longer suitable for designation as scenic.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the leased lands no longer contain a river designated as scenic.

Controlled Surface Use

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Antelope Creek, segment A - suitable scenic river

Stipulation: Exploration activities, including drilling and access, within _ mile of the normal high water mark on each side of the creek will be limited to established roadways.

Objective: To minimize surface disturbance, water sedimentation and pollution, and visual impairment.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area are no longer suitable for designation as scenic.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the leased lands no longer contain a river designated as scenic.

Controlled Surface Use

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Antelope Creek, segment C - suitable scenic river

Stipulation: Exploration activities, including drilling and access, within _ mile of the normal high water mark on each side of the creek, will be limited to established roadways.

Objective: To minimize surface disturbance, water sedimentation and pollution, and visual impairment.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area are no longer suitable for designation as scenic.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the leased lands no longer contain a river designated as scenic.

Controlled Surface Use

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Spencer Creek - suitable scenic river

Stipulation: Exploration activities, including drilling and access, within 1/4 mile of the normal high water mark on each side of the creek, will be limited to established roadways.

Objective: To minimize surface disturbance, water sedimentation and pollution, and visual impairment.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area are no longer suitable for designation as scenic.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the leased lands no longer contain a river designated as scenic.

Additional Leasing Stipulations For The Preferred Alternative

No Surface Occupancy

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Protected habitat areas (PHAs)

Stipulation: No surface occupancy is allowed in PHAs.

Objective: To retain and/or restore old growth forest and habitat diversity.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area do not include PHAs.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the entire leasehold no longer includes PHAs.

Controlled Surface Use

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Protected habitat area buffers (PHABs)

Stipulation: Drill site construction and access in PHABs within this leasehold will be limited to established roadways.

Objective: To maintain old growth habitat features in areas subject to planned timber harvest.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area do not include PHABs.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the entire leasehold no longer includes PHABs.

Locatable Minerals Surface Management 43 CFR 3809 Standards For Exploration, Mining, And Reclamation On The Lakeview District

The following operational guidelines for mining activities have been compiled to assist the miner in complying with the 43 CFR 3809 regulations, which apply to all mining operations on BLM-administered lands. The manner in which the necessary work is to be done will be site-specific and all of the following standards may not apply to each mining operation. It is the mining claimant's and operator's responsibility to avoid "unnecessary or undue degradation" and they must perform all necessary reclamation work. Refer to 43 CFR 3809 regulations for general requirements. The BLM will provide site-specific guidelines for some mining proposals.

Construction And Mining

Vegetation Removal. Remove only that vegetation which is in the way of mining activities. On Oregon and California land merchantable timber must be marked by BLM prior to cutting, and may not be used for firewood. The same requirement is recommended for public land. It is recommended that small trees (less than 6 inches diameter at breast height [dbh]) and shrubs are to be lopped and scattered, or shredded for use as mulch. Trees over 12 inches dbh should be bucked and stacked in an accessible location unless they are needed for the mining operation.

Firewood. Firewood may not be cut, sold, or used off of the mining claims.

Topsoil. All excavations should have all productive topsoil (usually the top 12 to 18 inches) first stripped, stockpiled, and then protected from erosion for use in future reclamation. This also includes removal of topsoil before the establishment of mining waste dumps and tailings ponds, if the waste material will be left in place during reclamation.

Roads. Existing roads and trails should be used as much as possible. Temporary roads are to be constructed to a minimum width and with minimum cuts and fills. All roads shall be constructed so as not to negatively impact slope stability.

Water Quality. When mining will be in or near bodies of water or sediment will be discharged the Oregon Department of Environmental Quality (DEQ) will be contacted. It is the operator's responsibility to obtain any needed suction dredging, stream bed alteration, or water discharge permits required by the DEQ or other state agencies. Copies of such permits shall be provided to the area manager if a notice or plan of operations is filed.

Claim Monuments. Due to the history of small wildlife deaths, plastic pipe is no longer allowed for claim staking pursuant to state law. It is recommended that existing plastic pipe monuments have all openings permanently closed. Upon loss or abandonment of the claim, all plastic pipe must be removed from the public lands, and when old markers are replaced during normal claim maintenance, they are to be either wood posts, stone, or earth mounds consistent with state law.

Drill Sites. Exploratory drill sites should be located next to or on existing roads when possible without blocking public access. When drill sites must be constructed, the size of the disturbance shall be as small as possible in order to conduct drilling operations.

Dust and Erosion Control. While in operation, and during periods of temporary shut-down, exposed ground surfaces susceptible to erosion will need to be protected. This can be accomplished with seeding, mulching, installation of water diversions, and routine watering of dust producing surfaces.

Fire Safety. All State fire regulations must be followed, including obtaining campfire or blasting permits if needed. All internal combustion engines must be equipped with approved spark arresters.

Safety and Public Exclusion. The general public may not be excluded from the mining claim. In the interest of safety, the general public can be restricted only from specific dangerous areas (underground mines, open pits, or heavy equipment) by erecting fences, gates, and warning signs. It is the operator's responsibility to protect the public from mining hazards. Gates or road blocks may be installed on existing or proposed roads only with the approval of the area manager.

Occupancy. All structures and/or trailers on mining claims must be used only for mining purposes (must be reasonably incident to mining) and should be covered by a notice or plan of operation. Use of such a structure for residential purposes not related to mining or for recreation is not authorized.

Suction Dredging. Filing either notice or plan of operations is required on all suction dredge operations. The operator must have the applicable DEQ suction dredge permit prior to starting work, and a copy should be submitted to the area manager.

Tailings Ponds. Settling ponds must be used to contain fines and any discharge into creeks must meet DEQ standards.

Trash & Garbage. Trash, garbage, used oil, etc. must be removed from public land and disposed of properly. No trash, garbage, or hazardous wastes shall be buried on public lands. Accumulations of trash, debris, or inoperable equipment on public lands is viewed as unnecessary degradation and will not be tolerated.

Cultural and Paleontological Resources. Operators shall not knowingly alter, injure, or destroy any scientifically important paleontological (fossil) remains or any historical or archaeological site, structure, or object on federal lands. The operator shall immediately bring to the attention of the area manager, any paleontological (fossil) remains or any historical or archaeological site, structure, or object that might be altered or destroyed by exploration or mining operations, and shall leave such discovery intact until told to proceed by the area

manager. The area manager shall evaluate the discovery, take action to protect or remove the resource, and allow operations to proceed within 10 working days.

Threatened or Endangered Species of Plants and Animals. Operators shall take such action as may be needed to prevent adverse impacts to threatened or endangered species of plants and animals and their habitat which may be affected by operations. Special status species (such as federal candidate/Bureau sensitive) of plants and animals, and their habitat, will be identified by the area manager, and shall be avoided wherever possible.

Reclamation

Reclamation of all disturbed areas must be performed concurrently with mining, or as soon as possible after mining permanently ceases. Reclamation shall include, but shall not be limited to: saving topsoil for final application after reshaping of disturbed areas has been completed; measures to control erosion, landslides, and water runoff; measures to isolate, remove, or control toxic materials; reshaping the area disturbed, application of topsoil, and revegetation of disturbed areas, where reasonably practicable; and rehabilitation of fisheries and wildlife habitat. When reclamation of the disturbed area has been completed, except to the extent necessary to preserve evidence of mineralization, the area manager must be notified so that inspection of the area can be made.

Equipment and Debris. All mining equipment, vehicles, structures, debris, and trash must be removed from the public lands during periods of non-operation and/or at the conclusion of mining, unless written authorization from the area manager is given to the operator or claimant.

Backfilling and Recontouring. The first steps in reclaiming a disturbed site are backfilling excavations and reducing high walls. Coarse rock material should be replaced first, followed by medium sized material, with fine materials to be placed on top. Recontouring means shaping the disturbed area so that it will blend in with the surrounding lands and minimize the possibility of erosion.

Seedbed Preparation. Recontouring should include preparation of an adequate seedbed. This is accomplished by ripping or disking compacted soils to a depth of at least 6 inches in rocky areas and at least 12 inches in less rocky areas. This should be done following the contour of the land to limit erosion. All stockpiled settling pond fines, and then topsoil, are spread evenly over the disturbed areas.

Fertilizer. The area manager must be contacted to determine if fertilization will be necessary, and if so, the type and rate of application.

Revegetation. An area manager-approved revegetation prescription must be used to provide adequate revegetation for erosion control, wildlife habitat, and productive secondary uses of public lands.

Mulch. As directed by the area manager, during review of the notice or plan of operations, the disturbed area may require mulching during interim or final reclamation procedures. Depending on site conditions, the mulch may need to be punched, netted, or blown on with a tackifier (a binder for the mulch) to hold it in place. In some cases, erosion control blankets may be cost effective for use.

Roads. After mining is completed, all new roads shall be reclaimed, unless otherwise specified by the area manager. High wall and cutbanks will be knocked down or backfilled to blend with the surrounding landscape. All culverts will be removed from drainage crossings and the fill cut back to the original channel. The roadbed should be ripped to a minimum depth of 12 inches to reduce compaction and provide a good seedbed. The road must then be fertilized and seeded if necessary. When necessary, waterbars will be used to block access and provide drainage.

Tailings Ponds. The ponds should be allowed to dry out and the fines removed and spread with the topsoil, unless the fines contain toxic materials. If the ponds contain toxic materials, a plan will be developed to identify, mitigate effects from, and then dispose of the toxic materials. If necessary, a monitoring plan will also be implemented. The ponds should then be backfilled and reclaimed.

Guidelines For Development Of Salable Mineral Resources In The Lakeview District

Proposed Operations

All proposed pits and quarries, and any exploration that involves surface disturbance, are required to have operating and reclamation plans approved by the area manager. All proposals will undergo the appropriate level of review and compliance with the National Environmental Policy Act.

Operating Procedures

Where practicable, the following requirements should be made a part of every contract or permit providing for the use of mineral material sites on the district:

- Oversized boulders shall not be wasted, but shall be broken and utilized concurrently with the excavated material.
- The operator shall comply with local and state safety codes covering quarry operations, warning signs, and traffic control. All necessary permits must be obtained from state and county agencies.
- Use of the site for equipment storage and stockpiling rock material is allowed for the duration of the contract or permit. Use of the site beyond that time would be authorized under a special use permit.
- All topsoil shall be stockpiled or windrowed, as appropriate, for use in reclamation.
- Prior to abandonment, all material sites will be graded to conform with the surrounding topography. Oversize material that is not usable, and reject, will be placed in the bottom of the pit, graded, and then the pit floor and cutslopes covered with topsoil. Reseeding, if necessary, will be done as prescribed by the area manager. Access roads no longer needed by the BLM will be abandoned and reclaimed as directed by the area manager.

Quarry Design

When the operating area is in steep terrain, quarry developments will require a series of benches to effectively maximize the amount of mineral materials removed in a safe manner. In most cases, bench height should not exceed 40 feet, and if the bench will be used by bulldozers to access other parts of the quarry, the width of the bench should be at least 25 feet. If the bench is not used by equipment, then this width can be reduced to approximately 10 feet.

Clearing of timber and brush should be planned at least 10 feet beyond the edge of the excavation limit. Most often the brush will be piled and burned at the site, or scattered nearby.

If at all possible, all topsoil and overburden should be stockpiled and saved for eventual quarry site reclamation. These piles may need to be stabilized by seeding in order to minimize erosion during the winter months.

As a standard procedure, the excavation of the quarry floor should be designed with an outslope of approximately 3 percent in order to provide for adequate drainage of the floor. Compliance with this design should be made a requirement of all operators at the site.

Appendix 2-H
Livestock Grazing Allotments

Introduction

This appendix has three sections. The first section is a summary of allotment changes proposed under the Preferred alternative. Section two is a numerical listing of allotments. The last section give the current status of all allotments, potential range improvements, resource concerns and conflicts, and comparisons of management actions by alternative.

Preferred Alternative Allotment Category Changes

Allotments involved with proposed livestock reductions based on the preferred alternative are as follows:

Allotment Category	Aums Proposed Reduction
0876 Bear Valley (I)	75
0889 Timber Hill (I)	145
0890 Willow Valley (I)	220
Stukel Mountain:	
0815 Stukel Dehlinger (I)	90
0822 Jeld Wen (I)	60
0852 Rodgers (I)	74
0859 Cunard (I)	20

The Klamath Falls Resource Area interdisciplinary team reviewed all allotments within the resource area on December 17, 1991 for changes in categorization. The parameters used in the process were directly in line with the BLM's categorization criteria (M,I,C [see the chapter 3 Livestock Grazing section]) as outlined in the Rangeland Improvement policy.

The following are the changes to present allotment categories which were initiated in the meeting.

I to C	I to M
Gerber Block:	**Swan Lake Rim**
0883 Horton (sec 3)	0858 Venable & Biaggi (sec 15)
0888 Rock Creek (sec 3)	
0884 Panky Basin (sec 15)	
Stukel Mountain	
0828 Stukel Hill (sec 15)	
Bryant Mountain	
0836 Harpold Chaining (sec 15)	
0855 Smith (sec 15)	
Windy Ridge	
0829 Horton (sec 15)	
0838 Windy Ridge (sec 15)	
Klamath Forest Estates	
0860 McCartie (sec 15)	
0811 Cheyne (sec 15)	

Listing by Allotment Number

Allotment Number	Allotment Name
0101	Chase Mountain
0102	Edge Creek - Ward Pasture
0102	Edge Creek - Edge Creek & North Pastures
0103	Buck Mountain
0104	Buck Lake
0105	Johnson Prairie
0107	Dixie
0140	Dry Lake
0141	Chicken Hills
0142	Long Lake
0147	Grubb Springs
0800	Adams
0801	Haught
0802	Stock Drive
0803	J. Spring
0804	Bar CL
0805	SE 80
0806	Two Mile
0807	Barnwell
0808	Lee
0809	Brown
0810	Brenda
0811	Cheyne
0812	Stukel-Coffin
0813	Plum Hills
0814	Cunningham
0815	Stukel-Dehlinger
0816	Stukel-Dehlinger
0817	Drew
0818	Duncan
0819	Dupont
0820	Flesher
0821	North Horsefly
0822	Jeld Wen
0823	Horsefly
0824	Jeld Wen
0825	Naylox
0826	Haskins
0827	Stukel-High
0828	Stukel-Hill
0829	Horton
0830	Hundry Hollow
0831	Warlow
0832	Jesperson
0833	Johnson
0834	Kellison
0835	Kethcham
0836	Harpold

Listing by Allotment Number (cont.)

Allotment Number	Allotment Name
0837	Horton
0838	Windy Ridge
0839	Bryant Loveness
0840	Bryant Lyon
0841	Marshall
0842	Masten
0843	McAuliffe
0844	Paddock Butte
0845	K-Hills - O'Connor
0846	OK
0847	Swede Cabin
0848	Pope
0849	Rajnus Bros.
0850	Wilkinson
0851	Harpold Ridge
0852	Rodgers
0853	7C
0854	Jump
0855	Smith
0856	Stastny
0857	Taylor
0858	Biaggi
0859	Cunard
0860	McCartie
0861	Williams
0862	Klamath Forest Estate
0863	Wirth
0864	Rajnus & Son
0865	Mills Creek
0876	Bear Valley
0877	Bumpheads
0878	Campbell
0879	Devaul
0881	Goodlow
0882	Horsefly
0883	Horton
0884	Panky Basin
0885	Dry Prairie
0886	Horse Camp Rim
0887	Pitchlog
0888	Rock Creek
0889	Timber Hill
0890	Willow Valley
0892	Williams
0893	Fields
0894	Voight
0895	Harpol Canyon
0896	McFall

Livestock Grazing Management Actions By Allotment

Allotment Name:	Chase Mountain	Management Category:	C
Allotment Number:	0101	Livestock Kind:	Cattle
Public Acres:	8,823	Other Acres:	19,680

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	195	Deer:	1,681
Suspended Nonuse:	0	Elk:	0
Total Preference:	195	Antelope:	0
Exchange of Use:	805	Horses:	0
Total:	**1,000**	**Total:**	**1,681**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	PA
Livestock AUMs	195	430	350	195	150	150	195
Season of Use	5/01-10/15	5/01-10/31	5/15-10/01	5/15-9/01	5/15-7/15	5/15-7/15	5/15-9/01

POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	3	3	3	3	2	2	3
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Edge Creek (Ward, Edge Creek & North Pastures)	Management Category:	I
Allotment Number:	0102	Livestock Kind:	Cattle
Public Acres:	8,860	Other Acres:	29,400

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	207	Deer	1,681
Suspended Nonuse:	0	Elk:	100
Total Preference:	207	Antelope:	0
Exchange of Use:	845	Horses:	100
Total:	**1,052**	**Total:**	**1,881**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Detrimental use - distribution problems occur in the allotment.	Improve distribution to ensure against chronic heavy or detrimental utilization.
No grazing management system established in allotment. Large area that is not included in allotment but grazed in common with allotment.	Establish management system. Include south and east side of Klamath River Canyon in Edge Creek allotment. Control cattle numbers and season of use.
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.
Special status species and/or habitat exists within the allotment.	Prevent significant risk to well-being of special status species and/or habitat from BLM-authorized actions.
Riparian or aquatic habitat is in less than good habitat condition.	Maintain and improve riparian or aquatic habitat in good or better habitat condition.
Water quality may not currently meet DEQ water quality standards for beneficial use.	Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the DEQ.
River segment under study for inclusion in the National Wild and Scenic River System.	Adjust livestock grazing management within river corridor to conform with river management plan if Congressional approval of river segment occurs.
Potential ACEC within the allotment.	If designated, adjust allotment management, including levels and area of authorized use, seasons of use, and grazing system as required by ACEC management plan.
Potential and designated recreation sites occur within the area.	Improve and maintain recreation sites.

CONSTRAINTS

Officially listed threatened or endangered species and/or critical habitats occur within allotment. Mitigate all management practices, as needed, to ensure full compliance with the recovery plan in effect for the species in question.

Critical deer winter range occurs in allotment. Vegetation conversions must be coordinated to adequately address the needs of both big game and cattle. No more than 10 percent of current browse in deer winter range may be converted.

Allotment contains all or a portion of a wild horse herd management area. Management actions must be mitigated, as needed, to ensure free-roaming nature of the herd.

Ensure that substantial vegetation conversions do not significantly reduce the variety of plant species or communities in abundances necessary for their continued existence and normal functioning.

Ward Pasture

Alternatives	No Action	A	B	C	D	E	PA
Livestock AUMs	107	250	200	107	107	107	107
Season of Use	5/01-7/15	4/15-8/01	5/01-7/15	5/01-7/01	5/01-6/15	5/01-6/15	5/01-7/01

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	3	3	3	3	3	3	3
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	3	3	3	3	3	3	3
Vegetation Control (acres)	500	500	500	500	500	500	500

Edge Creek & North Pastures

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	100	150	100	100	100	100	100
Season of Use	5/15-10/15	4/15-10/15	5/01-10/01	5/01-9/01	5/01-7/15	5/01-7/15	5/01-9/01

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	1	1	1	1	1	1	1
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Buck Mountain		Management Category:	C	
Allotment Number:	0103		Livestock Kind:	Cattle	
Public Acres:	Medford District*	1,120	Other Acres:	Medford*	8,420
	Lakeview District	7,022		Lakeview	33,300
	Total	8,142		**Total**	41,720

*These acres are within the Medford District boundary but administered by the Klamath Falls Resource Area, Lakeview District.

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	204	Deer:	1,643
Suspended Nonuse:	0	Elk:	0
Total Preference:	204	Antelope:	0
Exchange of Use:	2,246	Horses:	0
Total:	**2,450**	**Total:**	**1,643**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Detrimental use - distribution problems occur in the allotment.	Improve distribution to ensure against chronic heavy or detrimental utilization
No forage allocations for elk use in the allotment have been made.	Allocate forage to meet elk forage demands.
Riparian or aquatic habitat is in less than good habitat condition.	Maintain and improve riparian or aquatic habitat in good or better habitat condition.
Potential and designated recreation sites occur within the area.	Improve and maintain recreation sites.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	204	400	300	204	204	204	204
Season of Use	5/15-10/01	5/01-10/15	5/15-10/01	5/15-9/01	5/15-7/15	5/15-7/15	5/15-9/01

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	3	0	0	3	3	3	3
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Buck Lake	Management Category:	C
Allotment Number:	0104	Livestock Kind:	Cattle
Public Acres:	11,971	Other Acres:	4,380

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	452	Deer:	2,129
Suspended Nonuse:	0	Elk:	0
Total Preference:	452	Antelope:	0
Exchange of Use:	169	Horses:	0
Total:	**621**	**Total:**	**2,129**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Detrimental use - distribution problems occur in the allotment.	Improve distribution to ensure against chronic heavy or detrimental utilization.
No forage allocations for elk use in the allotment have been made.	Allocate forage to meet elk forage demands.
Riparian or aquatic habitat is in less than good habitat condition.	Improve and maintain riparian or aquatic habitat in good or better habitat condition.
Water quality may not currently meet DEQ water quality standards for beneficial use.	Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the DEQ.
Potential and designated recreation sites occur within the area.	Improve and maintain recreation sites.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	452	900	700	452	452	225	452
Season of Use	7/01-10/15	6/01-10/31	6/15-10/01	7/01-9/15	7/01-9/15	7/01-9/01	7/01-9/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	3	2	3	3	5	3	3
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Johnson Prairie		Management Category:	C
Allotment Number:	0105		Livestock Kind:	Cattle
Public Acres:	120		Other Acres:	400

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	12	Deer:	0
Suspended Nonuse:	0	Elk:	0
Total Preference:	12	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**12**	**Total:**	**0**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Potential and designated recreation sites occur within the area.	Improve and maintain recreation sites.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	12	24	6	6	6	0	12
Season of Use	5/01-10/31	5/01-10/31	5/01-10/01	5/01-10/01	5/01-10/01	None	5/01-10/01
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0.5	0	0.5	0.5	0.5	0	0.5
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Dixie		Management Category:	I	
Allotment Number:	0107		Livestock Kind:	Cattle	
Public Acres:	Medford District*	3,260	Other Acres:	Medford*	14,060
	Lakeview	2,287		Lakeview	8,200
	Total	**5,547**		**Total**	**22,260**

*These acres are within the Medford District boundary but administered by the Klamath Falls Resource Area, Lakeview District.

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	415	Deer:	928
Suspended Nonuse:	0	Elk:	100
Total Preference:	415	Antelope:	0
Exchange of Use:	677	Horses:	50
Total:	**1,092**	**Total:**	**1,078**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Detrimental use - distribution problems occur in the allotment.	Improve distribution to ensure against chronic heavy or detrimental utilization.
No grazing management system established in the allotment.	Establish management system.
Critical deer winter range occurs in allotment.	Management system should reflect the importance of deer winter range.
Riparian or aquatic habitat is in less than good habitat condition.	Improve and maintain riparian or aquatic habitat in good or better habitat condition.
Water quality may not currently meet DEQ water quality standards for beneficial use.	Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the DEQ.
Potential and designated recreation sites occur within the area.	Improve and maintain recreation sites.

CONSTRAINTS

Officially listed threatened or endangered species and/or critical habitats occur within allotment. Mitigate all management practices, as needed, to ensure full compliance with the recovery plan in effect for the species in question.

Critical deer winter range occurs in allotment. Vegetation conversions must be coordinated to adequately address the needs of both big game and cattle. No more than 10 percent of current browse in deer winter range may be converted.

Allotment contains all or a portion of a portion of a wild horse herd management area. Management actions must be mitigated, as needed, to ensure free-roaming nature of the herd.

Ensure that substantial vegetation conversions do not significantly reduce the variety of plant species or communities in abundances necessary for their continued existence and normal functioning.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	415	500	415	415	415	415	415
Season of Use	5/01-10/15	4/15-10/31	5/01-10/01	5/15-9/15	5/15-9/15	5/15-9/15	5/15-9/15

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	2	2	2	4	4	4	4
Vegetation Control (acres)	200	200	200	200	200	200	200

Allotment Name:	Dry Lake	Management Category:	C
Allotment Number:	0140	Livestock Kind:	Cattle
Public Acres:	145	Other Acres:	1,040

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	10	Deer:	10
Suspended Nonuse:	0	Elk:	0
Total Preference:	10	Antelope:	0
Exchange of Use:	240	Horses:	0
Total:	**250**	**Total:**	**10**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	10	20	10	10	10	10	10
Season of Use	5/01-6/30	5/01-8/01	5/01-7/15	5/01-7/01	5/01-7/01	5/01-7/01	5/01-7/01

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Chicken Hills	Management Category:	C
Allotment Number:	0141	Livestock Kind:	Cattle
Public Acres:	3,422	Other Acres:	5,340

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	80	Deer:	931
Suspended Nonuse:	0	Elk:	0
Total Preference:	80	Antelope:	0
Exchange of Use:	296	Horses:	0
Total:	**376**	**Total:**	**931**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Detrimental use - distribution problems occur in the allotment.	Improve distribution to ensure against chronic heavy or detrimental utilization.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	80	160	120	80	80	80	80
Season of Use	5/15-9/15	5/01-10/01	5/15-9/15	5/15-8/01	5/15-7/15	5/15-7/15	5/15-8/01
Wildlife - AUMs							
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	5	5	5	5	5	5	5
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Long Lake	Management Category:	C
Allotment Number:	0142	Livestock Kind:	Cattle
Public Acres:	363	Other Acres:	1,160

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	18	Deer:	0
Suspended Nonuse:	0	Elk:	0
Total Preference:	18	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**18**	**Total:**	**0**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**
No forage allocations for deer use in the allotment have been made.	Allocate forage ot meet deer forage demands.
Riparian or aquatic habitat may be in less than good habitat.	Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	18	125	125	75	50	0	18
Season of Use	6/16-9/30	6/15-10/01	6/15-10/01	6/15-8/01	6/15-8/01	None	6/15-8/01
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	2	0	0	2	2	2	2
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	3	0	0	3	3	3	3
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Grubb Springs	Management Category:	C
Allotment Number:	0147	Livestock Kind:	Cattle
Public Acres:	3,524	Other Acres:	34,620

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	130	Deer:	650
Suspended Nonuse:	0	Elk:	0
Total Preference:	130	Antelope:	0
Exchange of Use:	1,000	Horses:	0
Total:	**1,130**	**Total:**	**650**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Riparian or aquatic habitat is in less than good habitat condition.	Maintain and improve riparian or aquatic habitat in good or better habitat condition.
Water quality may not currently meet DEQ water quality standards for beneficial use.	Maintain and improve water quality on public lands to meet or exceed standsars for beneficial uses, as specifically established by the DEQ.
Potential and designated recreation sites occur within the area.	Improve and maintain recreation sites.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	130	260	130	130	130	130	130
Season of Use	5/01-9/30	5/01-10/15	5/01-10/01	5/01-8/15	5/15-7/15	5/15-7/15	5/01-8/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Adams	Management Category:	C
Allotment Number:	0800	Livestock Kind:	Cattle
Public Acres:	40	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	6	Deer:	0
Suspended Nonuse:	0	Elk:	0
Total Preference:	6	Antelope:	0
Exchange of Use:	0	Horses:	0
Total	**6**	**Total:**	**0**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	6	10	6	6	4	2	6
Season of Use	5/15-10/31	4/15-8/01	5/01-7/15	5/01-6/15	5/01-5/31	5/01-5/31	5/15-10/31
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Haught	Management Category:	C
Allotment Number:	0801	Livestock Kind:	Cattle
Public Acres:	400	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	27	Deer:	7
Suspended Nonuse:	0	Elk:	0
Total Preference:	27	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	27	**Total:**	7

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	27	35	30	25	20	20	27
Season of Use	5/01-7/31	4/15-7/15	5/01-6/30	5/01-6/15	4/21-5/20	4/21-5/20	5/01-6/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	100	100	100	100	100	100	100

Allotment Name:	Stock Drive	Management Category:	C
Allotment Number:	0802	Livestock Kind:	Cattle
Public Acres:	40	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	2	Deer:	0
Suspended Nonuse:	0	Elk:	0
Total Preference:	2	Antelope:	0
Exchange of Use:	0	Horses:	0
Total	**2**	**Total:**	**0**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	2	6	4	2	2	2	2
Season of Use	5/01-6/30	4/15-7/15	5/01-6/30	5/01-5/31	5/01-5/31	5/01-5/31	5/01-5/31
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	"J" Spring	Management Category:	C
Allotment Number:	0803	Livestock Kind:	Cattle
Public Acres:	320	Other Acres:	260

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	7	Deer:	6
Suspended Nonuse:	0	Elk:	0
Total Preference:	7	Antelope:	2
Exchange of Use:	0	Horses:	0
Total	7	**Total:**	8

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	7	20	10	7	7	7	7
Season of Use	5/01-6/23	4/15-8/01	5/01-7/15	5/01-6/30	5/01-5/31	5/01-5/31	5/01-6/30

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Bar CL	Management Category:	C
Allotment Number:	0804	Livestock Kind:	Cattle
Public Acres:	480	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	20	Deer:	10
Suspended Nonuse:	22	Elk:	0
Total Preference:	42	Antelope:	0
Exchange of Use:	0	Horses:	0
Total	42	**Total:**	10

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	20	40	40	20	20	20	20
Season of Use	5/01 - 5/31	4/15 - 8/01	5/01 - 7/15	5/01 - 5/31	5/01 - 5/31	5/01 - 5/31	5/01-5/31

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	SE 80	Management Category:	C
Allotment Number:	0805	Livestock Kind:	Cattle
Public Acres:	80	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	8	Deer:	1
Suspended Nonuse:	0	Elk:	0
Total Preference:	8	Antelope:	0
Exchange of Use:	0	Horses:	0
Total	8	**Total:**	1

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	8	12	10	8	4	4	8
Season of Use	5/01-10/31	5/01-10/31	5/01-8/31	5/01-6/15	5/01-5/31	5/01-5/31	5/01-10/31

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Two Mile	Management Category:	C
Allotment Number:	0806	Livestock Kind:	Cattle
Public Acres:	817	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	80	Deer:	16
Suspended Nonuse:	0	Elk:	16
Total Preference:	80	Antelope:	0
Exchange of Use:	0	Horses:	0
Total	**80**	**Total:**	**32**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	80	18	12	12	12	12	80
Season of Use	5/01-9/30	5/01-8/01	5/01-7/15	5/01-6/15	5/01-6/15	5/01-6/15	5/01-9/30

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Barnwell	Management Category:	C
Allotment Number:	0807	Livestock Kind:	Cattle
Public Acres:	1,708	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	100	Deer:	80
Suspended Nonuse:	0	Elk:	0
Total Preference:	100	Antelope:	0
Exchange of Use:	0	Horses:	0
Total	**100**	**Total:**	**80**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Important waterfowl habitat exists within allotment.	Maintain or improve existing waterfowl habitat.
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	100	130	100	75	50	50	100
Season of Use	4/21-5/31	4/15-8/01	5/01-7/15	5/01-6/15	5/15-6/15	5/15-6/15	5/01-6/15

POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	1	2	2	1	0	0	1
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	2	2	2	2	2	2	2
Vegetation Control (acres)	80	0	80	80	80	0	80

Allotment Name:	Lee	Management Category:	C
Allotment Number:	0808	Livestock Kind:	Cattle
Public Acres:	40	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	10	Deer:	0
Suspended Nonuse:	0	Elk:	0
Total Preference:	10	Antelope:	0
Exchange of Use:	0	Horses:	0
Total	**10**	**Total:**	**0**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**
Important waterfowl habitat exists within allotment.	Maintain or improve existing waterfowl habitat.

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	10	20	15	10	10	0	10
Season of Use	6/01-8/15	6/01-8/01	6/01-7/15	6/01-6/30	6/01-6/31	No Grazing	6/01-6/30
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	1	1	1	1	1	1	1
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Brown	Management Category:	C
Allotment Number:	0809	Livestock Kind:	Cattle
Public Acres:	80	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	30	Deer:	1
Suspended Nonuse:	0	Elk:	0
Total Preference:	0	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**30**	**Total:**	**1**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Important waterfowl habitat exists within allotment.	Maintain or improve existing waterfowl habitat.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	30	30	20	10	10	0	30
Season of Use	6/01-8/31	6/01-8/01	6/01-7/15	6/01-6/30	6/01-6/30	None	6/01-6/30
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	1	1	1	1	1	1	1
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Brenda	Management Category:	C
Allotment Number:	0810	Livestock Kind:	Cattle
Public Acres:	1,300	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	124	Deer:	24
Suspended Nonuse:	0	Elk:	24
Total Preference:	124	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**124**	**Total:**	**48**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	124	124	110	90	60	60	124
Season of Use	5/01-9/30	4/15-8/01	5/01-7/15	5/01-6/30	5/15-6/15	5/15-6/15	5/01-6/30
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	60	60	60	60	60	30	60

Allotment Name:	Cheyne	Management Category:	C
Allotment Number:	0811	Livestock Kind:	Cattle
Public Acres:	840	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	51	Deer:	40
Suspended Nonuse:	0	Elk:	0
Total Preference:	51	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**51**	**Total:**	**40**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
No grazing management system established in allotment.	Establish management system.
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	51	60	51	51	40	30	51
Season of Use	5/01-6/15	4/15-8/01	5/01-7/15	5/01-6/15	5/01-5/31	5/01-5/31	5/01-6/15

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Stukel-Coffin	Management Category:	C
Allotment Number:	0812	Livestock Kind:	Cattle
Public Acres:	760	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	55	Deer:	14
Suspended Nonuse:	0	Elk:	5
Total Preference:	55	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	55	**Total:**	19

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	55	55	55	55	30	20	55
Season of Use	5/15-6/30	5/01-8/01	5/01-7/15	5/15-6/30	5/15-6/30	5/15-6/15	5/15-6/30
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Plum Hills	Management Category:	C
Allotment Number:	0813	Livestock Kind:	Cattle
Public Acres:	160	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	20	Deer:	4
Suspended Nonuse:	0	Elk:	0
Total Preference:	20	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**20**	**Total:**	**4**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	20	30	20	20	20	20	20
Season of Use	4/16-6/30	4/15-8/01	5/01-7/15	5/01-6/15	5/01-5/31	5/01-5/31	5/01-6/15

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Cunningham	Management Category:	C
Allotment Number:	0814	Livestock Kind:	Cattle
Public Acres:	840	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	108	Deer:	16
Suspended Nonuse:	0	Elk:	0
Total Preference:	108	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**108**	**Total:**	**16**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Active erosion occurs in the allotment.	Maintain and improve erosion condition to moderate or better condition.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	108	108	108	50	50	50	108
Season of Use	4/26 - 7/15	4/15 - 8/01	5/01 - 7/15	5/01 - 6/15	5/01 - 6/15	5/01 - 6/15	5/01-6/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Stukel-Dehlinger C	Management Category:	I
Allotment Number:	0815	Livestock Kind:	Cattle
Public Acres:	1,680	Other Acres:	560

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	240	Deer:	31
Suspended Nonuse:	0	Elk:	11
Total Preference:	240	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	240	**Total:**	42

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Detrimental use - distribution problems occur in the allotment.	Improve distribution to ensure against chronic heavy or detrimental utilization.
Range condition (livestock forage condition) is unsatisfactory.	Maintain and improve range condition to fair or better livestock forage condition.
Calculated capacity is less than total forage demand.	Allocate forage in priority order to satisfy demand for big game, then livestock. Balance authorized livestock use with production, subject to priority allocations.
Physiological needs of key forage species are not being met.	Meet physiological needs of key forage species.
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.
Active erosion occurs in the allotment.	Maintain and improve erosion condition in moderate or better erosion condition.
Potential and designated recreation sites occur within the area.	Improve or maintain recreation sites.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	240	200	200	150	120	120	150
Season of Use	4/16-9/15	4/15-8/15	5/01-8/01	5/01-6/30	5/15-6/30	5/15-6/15	5/01-6/30

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	1	1	1	1	0	0	1
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	80	0	80	80	80	80	80

Allotment Name:	Stukel-Dehlinger H	Management Category:	C
Allotment Number:	0816	Livestock Kind:	Cattle
Public Acres:	440	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	30	Deer:	8
Suspended Nonuse:	0	Elk:	0
Total Preference:	0	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**30**	**Total:**	**8**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	30	40	30	30	30	20	30
Season of Use	5/10-8/10	4/15-8/01	5/01-7/01	5/01-6/15	5/15-6/15	5/15-6/15	5/01-6/05

POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	40	40	40	40	40	40	40

Allotment Name:	Drew	Management Category:	C
Allotment Number:	0817	Livestock Kind:	Cattle
Public Acres:	720	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	72	Deer:	34
Suspended Nonuse:	0	Elk:	14
Total Preference:	72	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**72**	**Total:**	**48**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	72	120	100	72	50	50	72
Season of Use	5/01-6/30	4/15-8/01	5/01-7/15	5/01-6/30	5/15-6/15	5/15-6/15	5/01-6/30

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	1	2	1	1	1	0	1
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	100	100	100	100	100	40	100

Allotment Name:	Bryant-Duncan	Management Category:	C
Allotment Number:	0818	Livestock Kind:	Cattle
Public Acres:	200	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	15	Deer:	4
Suspended Nonuse:	0	Elk:	0
Total Preference:	15	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	15	**Total:**	4

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	15	25	20	15	10	10	15
Season of Use	5/01-5/31	4/15-7/15	5/01-6/30	5/01-6/15	4/21-5/20	4/21-5/20	5/01-6/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	1	1	1	1	1	1	1
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	100	100	100	100	100	100	100

Allotment Name:	Dupont	Management Category:	C
Allotment Number:	0819	Livestock Kind:	Cattle
Public Acres:	79	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demand (AUMs)	
Active Preference:	7	Deer:	0
Suspended Nonuse:	0	Elk:	0
Total Preference:	7	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	7	**Total:**	0

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	7	10	7	7	7	7	7
Season of Use	4/15-6/01	4/15-8/01	5/01-7/15	5/01-6/15	5/15-6/15	5/15-6/15	5/01-6/15

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Flesher	Management Category:	C
Allotment Number:	0820	Livestock Kind:	Cattle
Public Acres:	160	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demand (AUMs)**	
Active Preference:	16	Deer:	4
Suspended Nonuse:	0	Elk:	0
Total Preference:	16	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	16	**Total:**	4

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	16	20	16	16	8	8	16
Season of Use	5/01-7/31	4/15-8/01	5/01-7/01	5/01-6/15	5/15-6/15	5/15-6/15	5/01-6/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	80	80	80	80	80	40	80

Allotment Name:	North Horsefly	Management Category:	C
Allotment Number:	0821	Livestock Kind:	Cattle
Public Acres:	988	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	68	Deer:	18
Suspended Nonuse:	0	Elk:	0
Total Preference:	68	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**68**	**Total:**	**18**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	68	68	68	68	40	40	68
Season of Use	5/01-6/15	4/15-8/01	5/01-7/15	5/01-6/15	5/01-5/31	5/01-5/31	5/01-6/15

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Jeld-Wen	Management Category:	I
Allotment Number:	0822	Livestock Kind:	Cattle
Public Acres:	3,122	Other Acres:	3,160

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	210	Deer:	59
Suspended Nonuse:	0	Elk:	20
Total Preference:	210	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**210**	**Total:**	79

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**
Detrimental use - distribution problems occur in the allotment.	Improve distribution to ensure against chronic heavy or detrimental utilization.
Range condition (livestock forage condition) is unsatisfactory.	Maintain and improve range condition to fair or better livestock forage condition.
Calculated capacity is less than total forage demand.	Allocate forage in priority order to satisfy demands for big game, then livestock. Balance authorized livestock use with production, subject to priority allocations.
No grazing management system established in the allotment.	Establish management system.
Physiological needs of key forage species are not being met.	Meet physiological needs of key forage species.
Big game limited by unsatisfactory habitat condition.	Maintain and improve big game habitat in satisfactory condition.
Critical deer winter range occurs in allotments.	Management systems should reflect the importance of deer winter range.
Active erosion occurs in the allotment.	Maintain or improve erosion condition in moderate or better erosion condition.
Riparian or aquatic habitat is in less than good habitat condition.	Maintain and improve riparian or aquatic habitat in good or better habitat condition.
Potential and designated recreation sites occur within the area.	Improve and maintain recreation sites.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	210	250	200	150	150	100	150
Season of Use	5/01-7/15	4/15-8/15	5/01-8/01	5/01-7/01	5/15-7/01	5/15-6/15	5/01-7/01

POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	280	280	280	280	200	140	280

Allotment Name:	No. Horsefly	Management Category:	C
Allotment Number:	0823	Livestock Kind:	Cattle
Public Acres:	920	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	60	Deer:	17
Suspended Nonuse:	0	Elk:	0
Total Preference:	60	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**60**	**Total:**	**17**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	60	80	60	60	60	40	60
Season of Use	6/16/-8/01	4/15-8/09	5/01-7/15	5/01-6/15	5/01-5/31	5/01-5/31	5/01-6/15

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (numbers)	0	0	0	0	0	0	0
Springs (numbers)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Jeld-Wen	Management Category:	C
Allotment Number:	0824	Livestock Kind:	Cattle
Public Acres:	360	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	36	Deer:	7
Suspended Nonuse:	0	Elk:	0
Total Preference:	36	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	36	**Total:**	7

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	36	36	30	20	10	10	36
Season of Use	6/01-10/15	5/01-8/15	5/15-8/01	6/01-7/15	6/15-7/15	6/15-7/15	6/01-7/15

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (numbers)	1	2	1	1	1	0	1
Springs (numbers)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	80	80	80	80	80	40	80

Allotment Name:	Naylox	Management Category:	C
Allotment Number:	0825	Livestock Kind:	Cattle
Public Acres:	760	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	76	Deer:	14
Suspended Nonuse:	0	Elk:	0
Total Preference:	76	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**76**	**Total:**	**14**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**
Potential and designated recreation sites occur within the area.	Improve and maintain recreation sites.

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	76	76	50	30	30	30	76
Season of Use	6/01-9/30	5/01-8/01	5/01-7/15	5/01-6/30	5/01-5/31	5/01-5/31	5/01-6/30
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Haskins	Management Category:	C
Allotment Number:	0826	Livestock Kind:	Cattle
Public Acres:	560	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	80	Deer:	11
Suspended Nonuse:	0	Elk:	0
Total Preference:	80	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**80**	**Total:**	**11**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	80	100	80	80	80	60	80
Season of Use	5/01-7/15	4/15-8/01	5/01-7/15	5/01-6/15	5/01-5/31	5/01-5/31	5/01-6/15

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	80	80	80	80	80	40	80

Allotment Name:	Stukel-High	Management Category:	C
Allotment Number:	0827	Livestock Kind:	Cattle
Public Acres:	237	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	17	Deer:	5
Suspended Nonuse:	0	Elk:	0
Total Preference:	17	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	17	**Total:**	5

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**
Range condition (livestock forage condition) is unsatisfactory	Maintain and improve range condition to fair or better .livestock forage condition.
Physiological needs of key forage species are not being met.	Meet physiological needs of key forage species.
Big game limited by unsatisfactory habitat condition.	Maintain and improve big game habitat in satisfactory condition.
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.
Active erosion occurs in the allotment.	Maintain and improve erosion condition to moderate or better erosion condition.

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	17	17	17	17	17	10	17
Season of Use	5/01-8/31	4/15-8/01	5/01-7/01	5/01-6/15	5/15-6/15	5/15-6/15	5/01-6/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	80	80	80	80	80	40	80

Allotment Name:	Stukel-Hill	Management Category:	C
Allotment Number:	0828	Livestock Kind:	Cattle
Public Acres:	960	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	60	Deer:	18
Suspended Nonuse:	0	Elk:	7
Total Preference:	60	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**60**	**Total:**	**25**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Detrimental use - distribution problems occur in the allotment.	Improve distribution to ensure against chronic heavy or detrimental utilization.
Range condition (livestock forage condition) is unsatisfactory.	Maintain and improve range condition to fair or better livestock forage condition.
Calculated capacity is less than total forage demand.	Allocate forage in priority order to satisfy demands for big game, then livestock. Balance authorized livestock use with production, subject to priority allocations.
No grazing management system established in the allotment.	Establish management system.
Physiological needs of key forage species are not being met.	Meet physiological needs of key forage species.
Big game limited by unsatisfactory habitat condition.	Maintain and improve big game habitat in satisfactory condition.
Active erosion occurs in the allotment.	Maintain and improve erosion condition in moderate or better erosion condition.
Riparian or aquatic habitat is in less than good habitat condition.	Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	60	80	80	50	40	40	60
Season of Use	5/01-6/15	4/15-7/15	5/01-7/01	5/01-6/15	5/15-6/15	5/15-6/15	5/01-6/15

POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	1	1	1	1	1	1	1
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	80	40	40	80	80	40	80

Allotment Name:	Horton	Management Category:	C
Allotment Number:	0829	Livestock Kind:	Cattle
Public Acres:	760	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	26	Deer:	36
Suspended Nonuse:	0	Elk:	0
Total Preference:	26	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**26**	**Total:**	**36**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	26	50	40	26	26	26	26
Season of Use	4/21-6/30	4/15-8/01	5/01-7/15	5/01-6/15	5/15-6/15	5/15-6/15	5/01-6/15

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	2	2	2	2	2	1	2
Springs (number)	1	1	1	1	1	1	1
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	100	100	100	100	100	40	100

Allotment Name:	Hungry Hollow	Management Category:	C
Allotment Number:	0830	Livestock Kind:	Cattle
Public Acres:	280	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	40	Deer:	5
Suspended Nonuse:	0	Elk:	0
Total Preference:	40	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**40**	**Total:**	**5**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	40	50	40	40	30	20	40
Season of Use	6/01-8/31	4/15-8/01	5/01-7/15	5/01-6/15	5/01-5/31	5/01-5/31	5/01-6/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Warlow	Management Category:	C
Allotment Number:	0831	Livestock Kind:	Cattle
Public Acres:	460	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	50	Deer:	8
Suspended Nonuse:	0	Elk:	3
Total Preference:	50	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**50**	**Total:**	**11**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Riparian or aquatic habitat is in less than good habitat condition.	Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	50	50	45	40	40	35	50
Season of Use	5/01-9/30	4/15-7/15	5/01-6/30	5/01-6/15	4/21-5/20	4/21-5/20	5/01-9/30
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Jesperson	Management Category:	C
Allotment Number:	0832	Livestock Kind:	Cattle
Public Acres:	1,578	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	158	Deer:	30
Suspended Nonuse:	0	Elk:	30
Total Preference:	158	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**158**	**Total:**	**60**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	158	40	30	30	20	20	158
Season of Use	5/01-7/01	4/15-8/01	5/01-7/15	5/01-6/30	5/15-6/15	5/15-6/15	5/01-7/01
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	100	100	100	100	100	40	100

Allotment Name:	Bryant Johnson	Management Category:	C
Allotment Number:	0833	Livestock Kind:	Cattle
Public Acres:	40	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	6	Deer:	0
Suspended Nonuse:	0	Elk:	0
Total Preference:	6	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	6	**Total:**	0

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	6	6	6	6	6	6	6
Season of Use	6/01-9/30	4/15-8/01	5/01-7/15	5/01-6/15	5/01-5/31	5/01-5/31	5/01-6/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Kellison	Management Category:	C
Allotment Number:	0834	Livestock Kind:	Cattle
Public Acres:	335	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	19	Deer:	6
Suspended Nonuse:	0	Elk:	0
Total Preference:	19	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**19**	**Total:**	**6**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	19	25	19	19	15	10	19
Season of Use	5/01-6/13	4/15-8/01	5/01-7/15	5/01-6/15	5/01-5/31	5/01-5/31	5/01-6/15

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Kethcham	Management Category:	C
Allotment Number:	0835	Livestock Kind:	Cattle
Public Acres:	320	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	20	Deer:	16
Suspended Nonuse:	0	Elk:	0
Total Preference:	20	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**20**	**Total:**	**16**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	20	40	30	20	20	20	20
Season of Use	5/01-7/31	4/15-8/01	5/01-7/15	5/01-6/15	5/15-6/15	5/15-6/15	5/01-6/15

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	80	80	80	80	80	40	80

Allotment Name:	Harpold	Management Category:	C
Allotment Number:	0836	Livestock Kind:	Cattle
Public Acres:	900	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	96	Deer:	101
Suspended Nonuse:	0	Elk:	0
Total Preference:	96	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**96**	**Total:**	**101**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
No grazing management system established in the allotment.	Establish management system.
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	96	125	96	96	50	0	96
Season of Use	5/01-5/31	4/15-6/15	5/01-6/15	5/01-5/31	5/01-5/15	None	5/01-5/31

POTENTIAL RANGE IMPROVEMENTS

	No Action	A	B	C	D	E	PA
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	500	500	500	500	500	500	500

Allotment Name:	Horton	Management Category:	C
Allotment Number:	0837	Livestock Kind:	Cattle
Public Acres:	1,249	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	130	Deer:	24
Suspended Nonuse:	0	Elk:	8
Total Preference:	130	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**130**	**Total:**	**32**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	130	130	100	100	100	0	130
Season of Use	5/16-8/15	6/15-8/15	6/15-8/01	6/01-6/30	5/15-6/15	None	6/01-6/30

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Windy Ridge	Management Category:	C
Allotment Number:	0838	Livestock Kind:	Cattle
Public Acres:	600	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	52	Deer:	11
Suspended Nonuse:	0	Elk:	0
Total Preference:	52	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	52	**Total:**	11

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**
No grazing management system established in the allotment.	Establish management system.
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	52	80	65	52	52	52	52
Season of Use	5/01-6/30	4/15-8/01	5/01-7/15	5/01-6/15	5/15-6/15	5/15-6/15	5/01-6/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	2	2	2	2	2	2	2
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	1	1	1	1	1	1	1
Vegetation Control (acres)	80	80	80	80	80	80	80

Allotment Name:	Bryant Loveness	Management Category:	C
Allotment Number:	0839	Livestock Kind:	Cattle
Public Acres:	3,440	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	490	Deer:	161
Suspended Nonuse:	0	Elk:	21
Total Preference:	490	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**490**	**Total:**	**182**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	490	550	500	450	400	350	490
Season of Use	4/21-7/28	4/15-8/15	5/01-8/15	5/01-6/30	5/01-6/15	5/01-5/31	5/01-6/30

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	100	100	100	100	100	100	100

Allotment Name:	Bryant Lyon	Management Category:	C
Allotment Number:	0840	Livestock Kind:	Cattle
Public Acres:	565	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	38	Deer:	11
Suspended Nonuse:	0	Elk:	0
Total Preference:	38	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	38	**Total:**	11

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	38	40	35	30	25	20	38
Season of Use	5/01-9/30	4/15-6/15	5/01-6/15	5/01-5/31	4/15-5/14	4/15-5/14	5/01-5/31
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	40	40	40	40	40	40	40

Allotment Name:	Marshall	Management Category:	C
Allotment Number:	0841	Livestock Kind:	Cattle
Public Acres:	348	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	14	Deer:	17
Suspended Nonuse:	0	Elk:	0
Total Preference:	14	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	14	**Total:**	17

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	14	20	15	14	14	14	14
Season of Use	4/21-5/31	4/15-8/01	5/01-7/15	5/01-6/15	5/15-6/15	5/15-6/15	5/01-6/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	80	80	80	80	80	40	80

Allotment Name:	Masten	Management Category:	C
Allotment Number:	0842	Livestock Kind:	Cattle
Public Acres:	485	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	40	Deer:	10
Suspended Nonuse:	0	Elk:	0
Total Preference:	40	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**40**	**Total:**	**10**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	40	50	40	40	40	20	40
Season of Use	5/01-9/15	4/15-8/01	5/01-7/15	5/01-6/15	5/01-5/31	5/01-5/31	5/01-6/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	40	40	40	40	40	20	40

Allotment Name:	Mc Auliffe	Management Category:	C
Allotment Number:	0843	Livestock Kind:	Cattle
Public Acres:	80	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	10	Deer:	1
Suspended Nonuse:	0	Elk:	0
Total Preference:	10	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**10**	**Total:**	**1**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	10	20	15	10	10	10	10
Season of Use	5/01-5/31	4/15-6/30	4/15-6/15	5/01-5/31	5/01-5/31	5/01-5/31	5/01-5/31

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Paddock Butte	Management Category:	C
Allotment Number:	0844	Livestock Kind:	Cattle
Public Acres:	440	Other Acres:	240

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	31	Deer:	8
Suspended Nonuse:	0	Elk:	0
Total Preference:	31	Antelope:	3
Exchange of Use:	0	Horses:	0
Total:	**31**	**Total:**	**11**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	31	50	40	31	20	20	31
Season of Use	5/01-6/30	4/15-8/01	5/01-7/15	5/01-6/30	5/01-5/31	5/01-5/31	5/01-6/30

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	K-Hills O'Connor	Management Category:	C
Allotment Number:	0845	Livestock Kind:	Cattle
Public Acres:	500	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	55	Deer:	10
Suspended Nonuse:	0	Elk:	0
Total Preference:	55	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**55**	**Total:**	**10**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	55	85	55	30	30	30	55
Season of Use	4/01-5/31	4/15-8/01	5/01-7/15	5/01-6/15	5/15-6/15	5/15-6/15	5/01-6/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	OK	Management Category:	C
Allotment Number:	0846	Livestock Kind:	Cattle
Public Acres:	1,260	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	140	Deer:	24
Suspended Nonuse:	0	Elk:	0
Total Preference:	140	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**140**	**Total:**	**24**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**
Potential and designated recreation sites occur within the area.	Improve and maintain recreation sites.

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	140	275	142	137	137	137	140
Season of Use	5/01 - 6/30	4/15 - 8/01	5/01 - 7/15	5/01 - 6/15	5/15 - 6/15	5/15 - 6/15	5/01-6/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	4	4	4	4	4	4	4
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	5	5	5	5	5	5	5
Vegetation Control (acres)	80	80	80	80	80	80	80

Allotment Name:	Swede Cabin	Management Category:	C
Allotment Number:	0847	Livestock Kind:	Cattle
Public Acres:	1,921	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	108	Deer:	36
Suspended Nonuse:	0	Elk:	0
Total Preference:	108	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**108**	**Total:**	**36**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**
Special status species and/or habitat exists within the allotment.	Prevent significant risk to well-being of special status species and/or habitat from BLM-authorized actions.

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	108	108	108	108	80	80	108
Season of Use	5/01-6/15	5/01-6/15	5/01-6/15	5/01-6/15	5/01-5/31	5/01-5/31	5/01-6/15

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Pope	Management Category:	C
Allotment Number:	0848	Livestock Kind:	Cattle
Public Acres:	1,044	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	70	Deer:	19
Suspended Nonuse:	0	Elk:	0
Total Preference:	70	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**70**	**Total:**	**19**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	70	70	70	70	35	35	70
Season of Use	5/01-9/30	4/15-8/01	5/01-7/15	5/01-6/15	5/15-6/15	5/15-6/15	5/01-6/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	180	180	180	180	180	80	180

Allotment Name:	Rajnus Bros.	Management Category:	C
Allotment Number:	0849	Livestock Kind:	Cattle
Public Acres:	480	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	32	Deer:	10
Suspended Nonuse:	0	Elk:	0
Total Preference:	32	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**32**	**Total:**	**10**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	32	50	40	32	20	20	32
Season of Use	4/15-8/31	4/15-8/01	5/01-7/15	5/01-6/15	5/15-6/15	5/15-6/15	5/01-6/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	80	80	80	80	80	40	80

Allotment Name:	Wilkinson	Management Category:	C
Allotment Number:	0850	Livestock Kind:	Cattle
Public Acres:	320	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	18	Deer:	6
Suspended Nonuse:	0	Elk:	0
Total Preference:	18	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**18**	**Total:**	**6**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	18	30	25	18	18	18	18
Season of Use	5/01-6/05	4/15-8/01	5/01-7/15	5/01-6/15	5/15-6/15	5/15-6/15	5/01-6/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	1	2	1	1	1	0	1
Springs (number)	1	1	1	1	1	1	1
Fence (miles)	2	2	2	2	2	0	2
Vegetation Control (acres)	100	100	100	100	100	40	100

Allotment Name:	Harpold Ridge	Management Category:	M
Allotment Number:	0851	Livestock Kind:	Cattle
Public Acres:	1,043	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	108	Deer:	49
Suspended Nonuse:	0	Elk:	0
Total Preference:	108	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**108**	**Total:**	**49**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	108	150	108	70	70	70	108
Season of Use	4/21-6/30	4/15-7/15	4/21-6/30	4/21-5/20	4/21-5/20	4/21-5/20	4/21-5/20

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	2	2	2	2	2	2	2
Springs (number)	1	1	1	1	1	1	1
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	100	100	100	100	100	100	100

Allotment Name:	Rodgers	Management Category:	I
Allotment Number:	0852	Livestock Kind:	Cattle
Public Acres:	2,549	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	249	Deer:	48
Suspended Nonuse:	0	Elk:	17
Total Preference:	249	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**249**	**Total:**	**65**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Detrimental use - distribution problems occur in the allotment.	Improve distribution to ensure against chronic heavy or detrimental utilization.
Range condition (livestock forage condition) is unsatisfactory.	Maintain and improve range condition to fair or better livestock forage condition.
Calculated capacity is less than total forage demand.	Allocate forage in priority order to satisfy demands for big game, then livestock. Balance authorized livestock use with production, subject to priority allocations.
No grazing management system established in the allotment.	Establish management system.
Physiological needs of key forage species are not being met.	Meet physiological needs of key forage species.
Big game limited by unsatisfactory habitat condition.	Maintain and improve big game habitat in satisfactory condition.
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.
Active erosion occurs in the allotment.	Maintain and improve erosion condition in moderate or better erosion condition.
Riparian or aquatic habitat is in less than good habitat condition.	Maintain and improve riparian or aquatic habitat in good or better habitat condition.
Potential and designated recreation sites occur within the area.	Improve and maintain recreation sites.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	249	300	250	175	125	125	175
Season of Use	4/15-8/31	4/15-8/15	5/01-8/01	5/15-7/01	5/15-6/15	5/15-6/15	5/15-7/01

POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	2	2	2	2	2	2	2
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	3	3	3	3	3	3	3
Vegetation Control (acres)	350	350	350	350	350	200	350

Allotment Name:	7C	Management Category:	C
Allotment Number:	0853	Livestock Kind:	Cattle
Public Acres:	688	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	104	Deer:	13
Suspended Nonuse:	0	Elk:	0
Total Preference:	104	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**104**	**Total:**	**13**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Special status species and/or habitat exists within the allotment.	Prevent significant risk to well-being of special status species and/or habitat from BLM-authorized actions.

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	104	104	104	104	80	80	104
Season of Use	5/01-6/30	4/15-8/01	5/01-7/15	5/01-6/15	5/01-5/31	5/01-5/31	5/01-6/30
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Jump	Management Category:	C
Allotment Number:	0854	Livestock Kind:	Cattle
Public Acres:	200	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	20	Deer:	4
Suspended Nonuse:	0	Elk:	0
Total Preference:	20	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	20	**Total:**	4

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	20	30	20	20	20	10	20
Season of Use	5/01-5/31	4/15-7/01	5/01-6/15	5/01-5/31	5/01-5/31	5/01-5/31	5/01-5/31
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	80	80	80	80	80	40	80

Allotment Name:	Bryant Smith	Management Category:	C
Allotment Number:	0855	Livestock Kind:	Cattle
Public Acres:	1,140	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	109	Deer:	22
Suspended Nonuse:	0	Elk:	7
Total Preference:	109	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	109	**Total:**	29

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**
Detrimental use - distribution problems occur in the allotment.	Improve distribution to ensure against chronic heavy or detrimental utilization.
No grazing management system established in the allotment.	Establish management system.
Riparian or aquatic habitat is in less than good habitat condition.	Maintain and improve riparian or aquatic habitat in good or better habitat condition.
Potential and designated recreation sites occur within the area.	Improve and maintain recreation sites.

Alternatives	**No Action**	A	B	C	D	E	PA
Livestock - AUMs	109	109	75	60	35	0	109
Season of Use	5/15-8/31	5/01-8/01	5/15-7/15	5/15-6/15	5/01-5/31	None	5/15-6/15

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Bryant Stastny	Management Category:	C
Allotment Number:	0856	Livestock Kind:	Cattle
Public Acres:	440	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	70	Deer:	8
Suspended Nonuse:	0	Elk:	3
Total Preference:	70	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**70**	**Total:**	**11**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	PA
Livestock - AUMs	70	75	70	70	65	65	70
Season of Use	5/10-9/30	4/15-7/15	5/01-6/30	5/01-6/15	5/01-5/31	5/01-5/31	5/10-9/30

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Bryant Taylor	Management Category:	C
Allotment Number:	0857	Livestock Kind:	Cattle
Public Acres:	1,080	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	74	Deer:	14
Suspended Nonuse:	0	Elk:	4
Total Preference:	74	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**74**	**Total:**	**18**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**
Potential and designated recreation sites occur within the area.	Improve and maintain recreation sites.

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**PA**
Livestock - AUMs	74	80	74	60	55	55	74
Season of Use	4/15-9/30	4/01-9/30	4/15-7/31	5/01-6/15	4/21-5/20	4/21-5/20	4/15-9/30
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Venable and Biaggi	Management Category:	M
Allotment Number:	0858	Livestock Kind:	Cattle
Public Acres:	6,448	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	300	Deer:	121
Suspended Nonuse:	0	Elk:	116
Total Preference:	300	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**300**	**Total:**	**237**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Detrimental use - distribution problems occur in the allotment.	Improve distribution to ensure against chronic heavy or detrimental utilization.
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.
Potential and designated recreation sites occur within the area.	Improve and maintain recreation sites.

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	300	400	350	300	200	200	300
Season of Use	5/01-6/30	4/15-8/01	5/01-7/15	5/01-6/30	5/15-6/15	5/15-6/15	5/01-6/30
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	2	1	0	0	0	0
Springs (number)	1	1	1	1	1	1	1
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	200	300	200	200	200	100	200

Allotment Name:	Cunard	Management Category:	I
Allotment Number:	0859	Livestock Kind:	Cattle
Public Acres:	370	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	60	Deer:	7
Suspended Nonuse:	0	Elk:	0
Total Preference:	60	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	60	**Total:**	7

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**
Detrimental use - distribution problems occur in the allotment.	Improve distribution to ensure against chronic heavy or detrimental utilization.
Range condition (livestock forage condition) is unsatisfactory.	Maintain and improve range condition to fair or better livestock forage condition.
Calculated capacity is less than total forage demand.	Allocate forage in priority order to satisfy demands for big game, then livestock. Balance authorized livestock use with production, subject to priority allocations.
No grazing management system established in the allotment.	Establish management system.
Physiological needs of key forage species are not being met.	Meet physiological needs of key forage species.
Big game limited by unsatisfactory habitat condition.	Maintain and improve big game habitat in satisfactory condition.
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.
Active erosion occurs in the allotment.	Maintain and improve erosion condition in moderate or better erosion condition.
Riparian or aquatic habitat is in less than good habitat condition.	Maintain and improve riparian or aquatic habitat in good or better habitat condition.
Potential and designated recreation sites occur within the area.	Improve and maintain recreation sites.

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	60	70	60	40	30	30	40
Season of Use	5/01-7/31	4/15-8/15	5/01-8/01	5/15-7/01	5/15-6/15	5/15-6/15	5/15-7/01

POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	2	2	2	2	2	2	2
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	80	80	80	80	80	40	80

Allotment Name:	McCartie	Management Category:	C
Allotment Number:	0860	Livestock Kind:	Cattle
Public Acres:	545	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	83	Deer:	25
Suspended Nonuse:	0	Elk:	0
Total Preference:	83	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	83	**Total:**	25

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
No grazing management system established in the allotment.	Establish management system.
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	83	100	83	83	70	60	83
Season of Use	5/01-5/31	4/15-8/01	5/01-7/15	5/01-6/15	5/01-5/31	5/01-5/31	5/01-6/15

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Williams	Management Category:	M
Allotment Number:	0861	Livestock Kind:	Cattle
Public Acres:	2,520	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	120	Deer:	119
Suspended Nonuse:	0	Elk:	0
Total Preference:	120	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**120**	**Total:**	**119**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	120	120	120	120	120	120	120
Season of Use	7/01-9/30	7/01-9/30	7/01-9/30	7/01-9/30	7/01-9/30	7/01-9/30	7/01-9/30

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Klamath Forest Estates	Management Category:	C
Allotment Number:	0862	Livestock Kind:	Cattle
Public Acres:	2,520	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	47	Deer:	47
Suspended Nonuse:	0	Elk:	0
Total Preference:	47	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	47	**Total:**	47

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	47	55	47	47	39	33	47
Season of Use	5/01-5/31	4/15-8/01	5/01-7/15	5/01-6/15	5/01-5/31	5/01-5/31	5/01-6/15

POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Wirth	Management Category:	C
Allotment Number:	0863	Livestock Kind:	Cattle
Public Acres:	1,360	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	113	Deer:	25
Suspended Nonuse:	0	Elk:	0
Total Preference:	113	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**113**	**Total:**	**25**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	113	113	113	50	50	50	113
Season of Use	4/15-10/15	4/15-8/01	5/01-7/15	5/01-6/15	5/01-6/15	5/01-6/15	4/15-10/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	1	1	1	1	1	1	1
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	2	2	2	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Rajnus & Son	Management Category:	C
Allotment Number:	0864	Livestock Kind:	Cattle
Public Acres:	1,440	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	110	Deer:	28
Suspended Nonuse:	0	Elk:	0
Total Preference:	110	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**110**	**Total:**	**28**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**P/A**
Livestock - AUMs	110	120	80	80	80	50	110
Season of Use	5/01-6/30	4/15-7/15	4/21-6/30	5/01-6/15	4/21-5/20	4/21-5/20	5/01-6/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	1	1	1	1	1	1	1
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	200	200	200	200	200	200	200

Allotment Name:	Mills Creek	Management Category:	C
Allotment Number:	0865	Livestock Kind:	Cattle
Public Acres:	280	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	40	Deer:	5
Suspended Nonuse:	0	Elk:	0
Total Preference:	40	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**40**	**Total:**	**5**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	40	50	40	30	20	20	40
Season of Use	5/01-6/14	4/15-6/15	5/01-6/15	5/01-5/31	4/15-5/14	4/15-5/14	5/01-5/31
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	1	1	1	1	1	1	1
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	1	1	1	1	1	1	1
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Bear Valley	Management Category:	I
Allotment Number:	0876	Livestock Kind:	Cattle
Public Acres:	5,018	Other Acres:	4,780

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	475	Deer:	94
Suspended Nonuse:	0	Elk:	0
Total Preference:	475	Antelope:	34
Exchange of Use:	0	Horses:	0
Total:	**475**	**Total:**	**128**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Detrimental use - distribution problems occur in the allotment.	Improve distribution to ensure against chronic heavy or detrimental utilization.
Active erosion occurs in the allotment.	Maintain and improve erosion condition in moderate or better erosion condition.
Riparian or aquatic habitat is in less than good habitat condition.	Improve and maintain riparian or aquatic habitat in good or better habitat condition.
Water quality may not currently meet DEQ water quality standards for use.	Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the DEQ.
Potential and designated recreation sites occur within this area.	Improve and maintain recreation sites.

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	475	475	400	400	300	300	400
Season of Use	6/21-8/31	6/21-9/01	6/21-8/15	6/21-8/01	6/21-7/15	6/21-7/15	6/21-8/01

POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	1	1	1	1	1	1	1
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	2	2	2	2	2	2	2
Vegetation Control (acres)	500	500	500	500	500	500	500

Allotment Name:	Bumpheads	Management Category:	I
Allotment Number:	0877	Livestock Kind:	Cattle
Public Acres:	9,220	Other Acres:	220

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	420	Deer:	173
Suspended Nonuse:	265	Elk:	0
Total Preference:	685	Antelope:	63
Exchange of Use:	0	Horses:	0
Total:	**685**	**Total:**	**236**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
No grazing management system established in the allotment.	Establish management system.
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.
Potential and designated recreation sites occur within the area.	Improve and maintain recreation sites.

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	420	420	420	420	300	300	420
Season of Use	4/21-6/30	4/15-8/01	4/15-7/15	4/15-6/30	4/15-6/15	5/01-6/15	4/15-6/30
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	2	2	2	2	2	2	2
Vegetation Control (acres)	500	500	500	500	500	500	500

Allotment Name:	Campbell	Management Category:	C
Allotment Number:	0878	Livestock Kind:	Cattle
Public Acres:	1,465	Other Acres:	3,140

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	47	Deer:	28
Suspended Nonuse:	12	Elk:	0
Total Preference:	59	Antelope:	10
Exchange of Use:	173	Horses:	0
Total:	**232**	**Total:**	**38**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Riparian or aquatic habitat is in less than good habitat condition.	Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	47	60	47	47	40	30	47
Season of Use	5/01-10/26	4/15-8/01	5/01-7/15	5/01-6/15	5/01-5/31	5/01-5/31	5/01-6/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Devaul	Management Category:	C
Allotment Number:	0879	Livestock Kind:	Cattle
Public Acres:	240	Other Acres:	320

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	12	Deer:	5
Suspended Nonuse:	15	Elk:	0
Total Preference:	27	Antelope:	2
Exchange of Use:	0	Horses:	0
Total:	27	**Total:**	7

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Riparian or aquatic habitat is in less than good habitat condition.	Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	12	20	12	12	12	12	12
Season of Use	5/01-8/31	4/15-8/31	5/01-8/15	5/01-8/01	4/15-7/15	5/01-7/01	5/01-8/01

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	1	1	1	1
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Goodlow	Management Category:	C
Allotment Number:	0881	Livestock Kind:	Cattle
Public Acres:	285	Other Acres:	640

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	32	Deer:	6
Suspended Nonuse:	52	Elk:	0
Total Preference:	84	Antelope:	2
Exchange of Use:	0	Horses:	0
Total:	84	**Total:**	8

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**P/A**
Livestock - AUMs	32	50	32	32	20	20	32
Season of Use	5/01-8/31	4/15-7/15	4/15-7/01	5/01-6/15	5/01-5/31	5/01-5/31	5/01-8/31

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	1	1	1	1	1	1	1
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	1	1	1	1	1	1	1
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Horsefly	Management Category:	I
Allotment Number:	0882	Livestock Kind:	Cattle
Public Acres:	26,356	Other Acres:	4,779

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	2,656	Deer:	495
Suspended Nonuse:	2,075	Elk:	30
Total Preference:	4,731	Antelope:	181
Exchange of Use:	70	Horses:	0
Total:	**4,801**	**Total:**	**706**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Detrimental use - distribution problems occur in the allotment.	Improve distribution to ensure against chronic heavy or detrimental utilization.
Range condition (livestock forage condition) is unsatisfactory.	Maintain and improve range condition to fair or better livestock forage condition.
No grazing management system established in the allotment.	Establish management system.
Physiological needs of key forage species are not being met.	Meet physiological needs of key forage species.
No forage allocations for elk use in the allotment have been made.	Allocate forage to meet elk forage demands.
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.
Special status species and/or habitat exists within the allotment.	Prevent significant risk to well-being of special status species and/or habitat from BLM-authorized actions.
Wetlands habitat in less than satisfactory condition.	Improve wetlands habitat condition to satisfactory or better.
Riparian or aquatic habitat is in less than good habitat condition.	Maintain and improve riparian or aquatic habitat in good or better habitat condition.
Water quality may not currently meet DEQ water quality standards for use.	Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the DEQ.
Potential and designated recreation sites occur within the area.	Improve and maintain recreation sites.

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	2,656	3,015	2,656	2,656	2,656	2,171	2,656
Season of Use	4/21-6/30	4/15-7/15	4/15-6/30	4/15-6/30	4/15-6/30	5/01-6/15	4/15-6/30

POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	2	2	2	2	2	2	2
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	3,000	3,000	3,000	3,000	3,000	3,000	3,000

Allotment Name:	Horton	Management Category:	C
Allotment Number:	0883	Livestock Kind:	Cattle
Public Acres:	880	Other Acres:	342

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	58	Deer:	41
Suspended Nonuse:	211	Elk:	0
Total Preference:	269	Antelope:	6
Exchange of Use:	15	Horses:	0
Total:	**284**	**Total:**	**47**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
No grazing management system established in the allotment.	Establish management system.
Physiological needs of key forage species are not being met.	Meet physiological needs of key forage species.
Critical deer winter range occurs in allotment.	Management systems should reflect the importance of deer winter range.
Potential and designated recreation sites occur within the area.	Improve and maintain recreation sites.

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	58	75	58	58	58	40	58
Season of Use	4/21-5/20	4/15-8/01	5/01-7/15	5/01-6/15	4/21-5/20	4/21-5/20	5/01-6/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	1	1	1	1	1	1	1
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	100	100	100	100	100	60	100

Allotment Name:	Panky Basin	Management Category:	C
Allotment Number:	0884	Livestock Kind:	Cattle
Public Acres:	282	Other Acres:	508

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	43	Deer:	5
Suspended Nonuse:	39	Elk:	0
Total Preference:	82	Antelope:	2
Exchange of Use:	95	Horses:	0
Total:	**177**	**Total:**	**7**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**
No grazing management system established in the allotment.	Establish management system.
Riparian or aquatic habitat is in less than good habitat condition.	Maintain and improve riparian or aquatic habitat in good or better habitat condition.
Water quality may not currently meet DEQ water quality standards for use.	Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the DEQ.

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**P/A**
Livestock - AUMs	43	65	43	43	43	43	43
Season of Use	5/15-8/31	5/01-8/15	5/01-8/15	5/01-8/01	5/01-7/15	5/01-7/01	5/01-8/01
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	2	2	2	2	2	2	2
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	1	0	0	1	1	1	1
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Dry Prairie	Management Category:	I
Allotment Number:	0885	Livestock Kind:	Cattle
Public Acres:	7,231	Other Acres:	3,624

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	608	Deer:	149
Suspended Nonuse:	392	Elk:	0
Total Preference:	1,000	Antelope:	55
Exchange of Use:	275	Horses:	0
Total:	**1,275**	**Total:**	**204**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
No grazing management system established in the allotment.	Establish management system.
No forage allocations for elk use in the allotment have been made.	Allocate forage to meet elk forage demands.
Special status species and/or habitat exists within the allotment.	Prevent significant risk to well-being of special status species and/or habitat from BLM-authorized actions.
Wetlands habitat in less than satisfactory condition.	Improve wetlands habitat condition to satisfactory or better.
Riparian or aquatic habitat is in less than good habitat condition.	Maintain and improve riparian or aquatic habitat in good or better habitat condition.
Water quality may not currently meet DEQ water quality standards for use.	Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the DEQ.
Potential and designated recreation sites occur within the area.	Improve and maintain recreation sites.

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	608	700	608	608	608	500	608
Season of Use	5/01-8/31	4/15-8/31	4/15-8/15	4/15-8/01	4/15-7/15	5/01-7/01	4/15-8/01

POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	3	3	3	3	3	3	3
Springs (number)	1	1	1	1	1	1	1
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	400	400	400	400	400	400	400

Allotment Name:	Horse Camp Rim	Management Category:	I
Allotment Number:	0886	Livestock Kind:	Cattle
Public Acres:	9,180	Other Acres:	40

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	445	Deer:	172
Suspended Nonuse:	0	Elk:	0
Total Preference:	445	Antelope:	63
Exchange of Use:	0	Horses:	0
Total:	**445**	**Total:**	**235**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
No grazing management system established in the allotment.	Establish management system.
No forage allocations for elk use in the allotment have been made.	Allocate forage to meet elk forage demands.
Riparian or aquatic habitat is in less than good habitat condition.	Maintain and improve riparian or aquatic habitat in good or better habitat condition.
Water quality may not currently meet DEQ water quality standards for use.	Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the DEQ.
Potential and designated recreation sites occur within the area.	Improve and maintain recreation sites.

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	445	500	445	445	445	400	445
Season of Use	5/01-7/31	4/15-8/01	4/15-8/01	5/01-7/31	4/15-7/15	5/01-6/15	5/01-7/31

POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	1	1	1	1	1	1	1
Vegetation Control (acres)	1,000	1,000	1,000	1,000	1,000	1,000	1,000

Allotment Name:	Pitchlog	Management Category:	I
Allotment Number:	0887	Livestock Kind:	Cattle
Public Acres:	9,280	Other Acres:	1,040

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	434	Deer:	174
Suspended Nonuse:	796	Elk:	37
Total Preference:	1,230	Antelope:	64
Exchange of Use:	80	Horses:	0
Total:	**1,310**	**Total:**	**275**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**
Detrimental use - distribution problems occur in the allotment.	Improve distribution to ensure against chronic heavy or detrimental utilization.
No grazing management system established in the allotment.	Establish management system.
No forage allocations for elk use in the allotment have been made.	Allocate forage to meet elk forage demands.
Wetlands habitat in less than satisfactory condition.	Improve wetlands habitat condition to satisfactory or better.
Riparian or aquatic habitat is in less than good habitat condition.	Maintain and improve riparian or aquatic habitat in good or better habitat condition.
Water quality may not currently meet DEQ water quality standards for use.	Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the DEQ.
Potential recreation sites exist, but are not fully developed.	Improve and maintain recreation sites.

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**P/A**
Livestock - AUMs	434	500	434	434	434	330	434
Season of Use	5/10-6/30	5/01-8/01	5/01-7/15	5/10-6/30	5/10-6/30	5/15-6/15	5/01-6/30

POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	2	2	2	2	2	2	2
Vegetation Control (acres)	1,000	1,000	1,000	1,000	1,000	1,000	1,000

Allotment Name:	Rock Creek	Management Category:	C
Allotment Number:	0888	Livestock Kind:	Cattle
Public Acres:	2,750	Other Acres:	1,200

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	216	Deer:	130
Suspended Nonuse:	639	Elk:	0
Total Preference:	855	Antelope:	19
Exchange of Use:	227	Horses:	0
Total:	**1,082**	**Total:**	**149**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
No forage allocations for elk use in the allotment have been made.	Allocate forage to meet elk forage demands.
Riparian or aquatic habitat is in less than good habitat condition.	Maintain and improve riparian or aquatic habitat in good or better habitat condition.
Water quality may not currently meet DEQ water quality standards for use.	Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the DEQ.
Potential and designated recreation sites occur within the area.	Improve and maintain recreation sites.

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	216	300	216	216	216	150	216
Season of Use	5/01-6/20	5/01-8/01	5/01-7/15	5/01-6/20	5/01-5/31	5/01-5/31	5/01-6/20
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	200	200	200	200	200	200	200

Allotment Name:	Timber Hill	Management Category:	I
Allotment Number:	0889	Livestock Kind:	Cattle
Public Acres:	2,937	Other Acres:	760

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	270	Deer:	55
Suspended Nonuse:	134	Elk:	0
Total Preference:	404	Antelope:	20
Exchange of Use:	34	Horses:	0
Total:	**438**	**Total:**	**75**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Detrimental use - distribution problems occur in the allotment.	Improve distribution to ensure against chronic heavy or detrimental utilization.
Range condition (livestock forage condition) is unsatisfactory.	Maintain and improve range condition to fair or better livestock forage condition.
No grazing management system established in the allotment.	Establish management system.
Physiological needs of key forage species are not being met.	Meet physiological needs of key forage species.
No forage allocations for elk use in the allotment have been made.	Allocate forage to meet elk forage demands.
Riparian or aquatic habitat is in less than good habitat condition.	Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	270	270	200	125	100	100	125
Season of Use	6/21-7/31	6/21-9/01	6/21-8/15	6/21-8/01	6/21-7/15	6/21-7/15	6/21-8/01

POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	2	2	2	2	2	2	2
Springs (number)	1	1	1	1	1	1	1
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	100	100	100	100	100	100	100

Allotment Name:	Willow Valley	Management Category:	I
Allotment Number:	0890	Livestock Kind:	Cattle
Public Acres:	20,460	Other Acres:	887

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	1,320	Deer:	960
Suspended Nonuse:	444	Elk:	0
Total Preference:	1,764	Antelope:	141
Exchange of Use:	175	Horses:	0
Total:	**1,939**	**Total:**	**1,101**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES
Detrimental use - distribution problems occur in the allotment.	Improve distribution to ensure against chronic heavy or detrimental utilization.
Range condition (livestock forage condition) is unsatisfactory.	Maintain and improve range condition to fair or better livestock forage condition.
Calculated capacity is less than total forage demand.	Allocate forage in priority order to satisfy demands for big game, then livestock. Balance authorized livestock use with production, subject to priority allocations.
Physiological needs of key forage species are not being met.	Meet physiological needs of key forage species.
No grazing management system established in the allotment.	Establish management system.
Riparian or aquatic habitat is in less than good habitat condition.	Maintain and improve riparian or aquatic habitat in good or better habitat condition.
No forage allocations for elk use in the allotment have been made.	Allocate forage to meet elk forage demands.
Wetlands habitat in less than satisfactory condition. condition.	Improve wetlands habitat to satisfactory or better
Special status species and/or habitat exists within the allotment.	Prevent significant risk to well-being of special status species and/or habitat from BLM-authorized actions.
Water quality may not currently meet DEQ water quality standards for use.	Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the DEQ.

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	1,320	1,320	1,100	1,100	1,100	900	1,100
Season of Use	4/21-6/20	4/15-7/15	4/15-7/15	4/15-6/30	4/15-6/01	4/15-5/15	4/15-6/30

POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	2	2	2	2	2	2	2
Springs (number)	2	2	2	2	2	2	2
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	1,500	1,500	1,500	1,500	1,500	1,500	1,500

Allotment Name:	Williams	Management Category:	M
Allotment Number:	0892	Livestock Kind:	Cattle
Public Acres:	1,790	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	75	Deer:	34
Suspended Nonuse:	0	Elk:	0
Total Preference:	75	Antelope:	12
Exchange of Use:	0	Horses:	0
Total:	**75**	**Total:**	**46**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	75	90	75	75	60	60	75
Season of Use	5/01-5/31	4/15-8/01	5/01-7/15	5/01-6/15	5/01-5/31	5/01-5/31	5/01-6/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Fields	Management Category:	C
Allotment Number:	0893	Livestock Kind:	Cattle
Public Acres:	180	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	6	Deer:	4
Suspended Nonuse:	0	Elk:	0
Total Preference:	6	Antelope:	1
Exchange of Use:	0	Horses:	0
Total:	6	**Total:**	5

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	6	12	10	6	6	6	6
Season of Use	4/15-5/20	4/15-8/01	4/21-6/30	4/21-5/20	4/21-5/20	4/21-5/20	4/21-5/20

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Allotment Name:	Voight	Management Category:	C
Allotment Number:	0894	Livestock Kind:	Cattle
Public Acres:	112	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	8	Deer:	2
Suspended Nonuse:	0	Elk:	0
Total Preference:	8	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	8	**Total:**	2

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	8	8	8	8	8	8	8
Season of Use	5/01-6/14	4/15-8/01	5/01-7/01	5/01-6/15	5/15-6/15	5/15-6/15	5/01-6/15
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	40	40	40	40	40	20	40

Allotment Name:	Harpold Canyon	Management Category:	C
Allotment Number:	0895	Livestock Kind:	Cattle
Public Acres:	760	Other Acres:	0

Grazing Administration Info. (AUMs)		Other Forage Demands (AUMs)	
Active Preference:	76	Deer:	20
Suspended Nonuse:	0	Elk:	0
Total Preference:	76	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**76**	**Total:**	**20**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	MANAGEMENT OBJECTIVES

Alternatives	No Action	A	B	C	D	E	P/A
Livestock - AUMs	76	80	76	70	60	55	76
Season of Use	5/01-9/30	4/15-9/01	5/01-8/15	5/01-7/31	5/01-6/30	5/01-6/30	5/01-7/31

POTENTIAL RANGE IMPROVEMENTS

Reservoirs (number)	0	0	0	0	0	0	0
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	100	100	100	100	100	100	100

Allotment Name:	McFall	Management Category:	C
Allotment Number:	0896	Livestock Kind:	Cattle
Public Acres:	600	Other Acres:	0

Grazing Administration Info. (AUMs)		**Other Forage Demands (AUMs)**	
Active Preference:	60	Deer:	11
Suspended Nonuse:	0	Elk:	0
Total Preference:	60	Antelope:	0
Exchange of Use:	0	Horses:	0
Total:	**60**	**Total:**	**11**

IDENTIFIED RESOURCES CONFLICTS/CONCERNS	**MANAGEMENT OBJECTIVES**

Alternatives	**No Action**	**A**	**B**	**C**	**D**	**E**	**P/A**
Livestock - AUMs	60	75	65	60	55	50	60
Season of Use	5/01-6/30	4/15-7/01	5/01-6/15	5/01-5/31	5/01-5/31	5/01-5/31	5/01-5/31
POTENTIAL RANGE IMPROVEMENTS							
Reservoirs (number)	1	1	1	1	1	1	1
Springs (number)	0	0	0	0	0	0	0
Fence (miles)	0	0	0	0	0	0	0
Vegetation Control (acres)	0	0	0	0	0	0	0

Appendix 2-I
Resource Management Plan Monitoring

Introduction

The BLM planning regulations (43 CFR 1610.4-9) call for monitoring and evaluating resource management plans at appropriate intervals. The purposes of monitoring and evaluating the RMP are to:

- Track progress of RMP implementation and assure that activities are occurring in conformance with the plan (implementation monitoring).
- Determine if activities are producing the expected results and meeting stated objectives (effectiveness monitoring).
- Determine if activities are causing the effects identified in the EIS (validation).

The implementation of the Klamath Falls Resource Area RMP will be monitored to ensure that management actions are being implemented and are meeting their intended purposes. Specific management actions arising from proposed activity plan decisions will be compared with RMP objectives to ensure consistency with the intent of the plan. Activity plan decisions may also, however, identify monitoring plans of their own. Such plans are addressed in this RMP monitoring plan only where RMP monitoring and activity plan monitoring overlap.

Some effectiveness monitoring and most validation can only be accomplished by formal research. *RMP-related research is discussed in chapter 2 and appendix 2-J of the RMP/EIS.* Monitoring will be conducted as specified in the following sections of this appendix. Monitoring results will be reported in an "Annual Program Summary", which will be published starting the second year following initial implementation of this RMP. The annual program summary will serve as a report to the public, track and assess the progress of plan implementation, and state the findings made through monitoring as the BLM determines if:

- Management actions are resulting in satisfactory progress toward achieving RMP objectives;
- actions are consistent with current policy;
- original assumptions are valid and impacts are within the range predicted, given the reliability of the predictions;
- mitigation and corrective measures are satisfactory and serving their purposes;
- the RMP is still consistent with the plans and policies of State or local government, other Federal agencies, and Indian tribes;
- new data are available that could result in alteration or amendment of the plan;
- NEPA requirements are being met; and
- compliance is being achieved on actions authorized by BLM.

Each resource area is responsible for the collection, compilation and analysis of much of the data gained through monitoring activities. Resource areas will report their findings and recommendations to the district for consolidation and publication in the "Annual Program Summary."

Representative areas, such as a watershed monitoring area, may be selected and established. Intensive monitoring and data collection efforts for certain resources may be made in these areas as opposed to collecting general data over the entire geographic area (which is often very expensive and provides less useful information). Attempts will be made to select representative areas that coincide for several resources.

All monitoring will follow written standards for the following, where relevant: sampling design, parameters to be monitored, analytical techniques, statistical methods for data analysis, and reporting units.

Involvement of other interested parties, including state agencies, in monitoring of plan implementation will be encouraged. This may entail coordinated monitoring efforts with parties that are able to fund their own participation in such efforts.

This monitoring plan is not static. During the life of the RMP the monitoring plan itself will be periodically evaluated to ascertain that the monitoring questions and standards remain relevant, and will be fine tuned as appropriate. BLM cooperation in the U.S. Environmental Protection Agency's Environmental Monitoring and Assessment Program (still under development) may specifically lead to revision of some elements of this plan.

Air Quality

Expected Future Conditions and Outputs

Compliance with the Oregon Smoke Management Plan and the State Implementation Plan, to help meet established air quality standards in accordance with the Clean Air Act.

Monitoring Questions

1. Are BLM prescribed fires contributing to intrusions into Class I areas? How frequently do intrusions occur?

2. Of intrusions that the BLM is reported to be responsible for, what was the cause and what can be done to minimize future occurrences?

Standards

1. Using the Oregon Smoke Management Annual Report and any BLM smoke surveillance reports, the number of intrusions BLM certainly or possibly contributed to will be determined annually. The percentage of total units burned that contributed (or might have) to such intrusions will be calculated.

2. Reported intrusions will be individually investigated to determine the most probable cause and establish possible corrective measures.

Costs

An estimated $3,000 to $5,000 annually.

Soil Productivity

Expected Future Conditions and Outputs

Soils will be managed to maintain long-term site productivity by avoiding or minimizing compaction/ displacement, surface erosion, and loss of organic material, including large woody debris.

Monitoring Question

Are management practices achieving the goal of maintaining long-term site productivity?

Standards

There are three components of the soil resource which will be monitored to answer the monitoring question.

1. **Compaction.** a). Implementation of best management practices (BMPs) to minimize compaction will be monitored for all surface disturbing activities. b). Effectiveness of practices to minimize compaction will be monitored for two harvest units in the resource area per year. Compaction will be assessed by establishing post treatment transects (such as a pace transect) and determining the extent of compacted areas. Results will be reported as the percent of area that is compacted.

2. **Surface Erosion.** a). Implementation of BMPs to minimize surface erosion will be monitored for all surface disturbing activities. b). Effectiveness of practices to minimizing surface erosion will be monitored for two harvest units in the resource area per year. Information will be qualitative and obtained by visual, professional estimate immediately after harvest or site preparation and again 2 years later. If information indicated unacceptable erosion rates, the soil scientist/hydrologist should use a standard procedure to quantify the rate of erosion.

3. **Organic material.** a). Implementation of BMPs to maintain minimum percent effective ground cover standards and to conserve organic material (including large woody debris) will be monitored for all prescribed burn units. b). Effectiveness of practices to maintain minimum percent effective ground cover and to meet the goal of retaining at least 10 tons per acre of 9-inch or smaller woody material and some large material will be monitored. At least two prescribed burn units and two harvest units in the resource area per year judged to be most sensitive to small and large woody debris removal will be monitored. A method such as the pace transect will be used to assess the amount of organic material remaining after burning or site preparation. Sites that are nutrient deficient or have a higher erosion potential will be priorities for monitoring. Effectiveness monitoring will be designed to achieve statistical validity and will incorporate established standard monitoring methods.

Costs

An estimated $8,000 annually.

Water Resources

Expected Future Conditions and Outputs

Water resources will be managed to protect, maintain, or improve the quality of water resources, stream ecosystems, and watershed values. Water quality will be maintained or enhanced through design of site-

specific best management practices (BMPs) in accordance with the Oregon Nonpoint Source Management Plan and the memorandum of agreement with Oregon Department of Environmental Quality. Best management practices (BMPs) will be implemented, evaluated, monitored, and adjusted as necessary to comply with basin specific water qualtiy criteria.

Monitoring Questions

1. Are site specific BMPs incorporated in project design and correctly applied?
2. Are applied BMPs achieving water resource objectives?
3. Are applied BMPs effective in maintaining or improving water quality consistent with basin-specific water quality criteria for protection of recognized beneficial uses?
4. Are watershed cumulative effects at or below the levels anticipated in the RMP/EIS and project-specific environmental assessments (EAs).
5. Are objectives for the biological, chemical, and physical functions of the stream ecosystem being met?

Standards

1. All management activities utilizing BMPs will be monitored to determine whether BMPs are incorporated in the project design and correctly applied. This will be accomplished primarily through contract administration.
2. A minimum of one timber sale and one surface disturbing activity other than forest management in the resource area per year will be monitored to determine whether the BMP objectives for water resources are being met.
3. Monitoring to determine effectiveness of BMPs in meeting water qualtiy criteria will be initiated on one timber sale or other surface/riparian disturbing activity per year and will continue for approximately four years. A maximum of four activities will be monitored at any given time.

   All water bodies that are within or adjacent to an area treated with herbicide and support a beneficial use will be monitored to determine effectiveness of BMPs in meeting water quality criteria.

   Effectiveness monitoring will be designed to achieve statistical validity and will incorporate established standard monitoring methods. Selection of locations and water quality parameters for BMP effectiveness monitoring will consider beneficial use(s) likely to be affected, BMPs being applied, and water quality criteria necessary to protect beneficial use(s).

   Baseline monitoring will continue in the resource area to determine long-term trends and to provide a basis of separating changes in water quality resulting from natural events from those potentially created by management actions. Standard monitoring methods such as those reported in the National Handbook of Recommended Methods for Water-Data Acquisition and Techniques of Water-Resources Investigation of the USGS will be followed. Further, the recent EPA publication Monitoring Guidelines to Evaluate Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska will help guide monitoring plan development. When Rapid Bioassessment protocols are refined, these procedures will be incorporated into planned monitoring activities.
4. The watershed condition index (WCI) used in the RMP/EIS, will be recalculated in the third, fifth, and seventh year of this plan to determine if cumulative effect levels are within the predicted range. Cumulative effects for small watersheds will be analyzed in each environmental assessment (EA).
5. Two stream miles per year will be monitored to determine whether stream ecosystem objectives, such as maintenance of stream function, are being met.

Costs

An estimated $30,000 annually.

Biological Diverstiy

Expected Future Conditions and Outputs

Contribute to maintenance of diversity of plant and animal species in western Oregon. The vegetative diversity of existing managed forest stands will increase, as to species, canopy layers and dead components. Landscape level (spatial) diversity on BLM-administered lands will be maintained or improved.

Monitoring Questions

What are the effects of BLM management on:

1. Acres of all seral stages?
2. Size and spatial distribution of old-growth blocks?

3. Retention of dead and down material?

4. Number of canopy layers?

5. Tree species composition in managed stands?

Monitoring for several other topics will also address elements of biological diversity; for example, special habitats, special status species, riparian zones, and retention of wildlife trees.

Standards

1. The baseline from BLM's 1988 inventory, updated to 1992, will be identified. Using Timber Sale Information System records and records of losses due to natural disturbance, old growth forest reductions will be monitored at five-year intervals. Using the operations inventory update of approximately year 2000, acres of all seral stages will be recalculated.

2. Ecological status monitoring of non-forest vegetation-types will be used as a baseline for acres of all seral stages relative to potential natural community of a site. Minimum standards for rangeland monitoring require that this data be collected at least once during a planning cycle (15 years), unless other monitoring studies indicate a need for more frequent updating. Range condition can be determined from an interpretation of ecological status data relative to management objectives, thus indicating if the current plant community satisfies management objectives.

3. Using the operations inventory update of approximately year 2000, size and spatial distribution of old growth blocks will be calculated and compared to analysis in the 1993 RMP/EIS.

4. Trend data collected by the rangeland monitoring program will be used to determine if management is resulting in resource changes that are either toward or away from objectives identified in the RMP. Minimum standards for rangeland monitoring require that these data be collected every 5 years in I category allotments and every 10 years in M and C category allotments.

5. Twenty percent of both regeneration harvest and density management timber sales will be examined within a year after harvest and site preparation to determine number of dead and down logs by diameter class, length, and distribution. Through the decadal forest inventory, the trends of dead and down material will be identified on both managed and unmanaged stands.

6. Acres of density management accomplished will be identified in annual work plan accomplishment reports. Through the decadal forest inventory, the number of canopy layers in established stands subject to management actions during the life of the plan will be identified.

7. First, third, and fifth year stocking surveys will be used to identify tree species composition. Through the decadal forest reinventory, species composition changes in established stands subject to management actions during the life of the plan will be identified.

Costs

Item 1 costs estimated at $1,000 every five years. Item 2 costs estimated at $360,000 (ecological status monitoring costs for resource area) every 10 to 15 years. Item 3 costs estimated at $1,000 annually. Item 4 costs estimated at $1,000 annually for trend monitoring in allotments to meet or exceed minimum standards for range monitoring. Item 5 can be accomplished concurrent with similar monitoring for retention of wildlife trees, at an annual cost of $2,000; its second part will be included in decadal forest inventory costs and is difficult to separate. Item 6 will negligibly affect normal data maintenance and inventory costs. Item 7 costs estimated at $2,000 annually, in addition to traditional costs of stocking surveys.

Riparian Zones

Expected Future Conditions and Outputs

Riparian management areas (RMAs) will be managed to protect stream ecosystem functions and riparian zones, and to maintain or improve riparian habitat for wildlife, fish, and for native plant diversity.

Monitoring Questions

1. What is the average width of RMAs established on the ground and retained following timber harvest, site preparation, or other management activities? How does it compare to the widths anticipated in the RMP/EIS?

2. Are sufficient numbers of mature conifers, snags, and downed trees retained within riparian buffers after harvest?

3. Are RMP-approved disturbances (for example, yarding corridors, grazing) within riparian zones meeting standards identified in the RMP/EIS? Are BMPs being implemented when and where appropriate and are these BMPs meeting their objectives?

Standards

1 and 2. Two harvest units within the resource area per year will be examined prior to harvest and site preparation and re-examined following harvest to determine whether buffers were retained and their average widths. Average widths will be determined by measurement at approximately equidistant points along the affected stream reach within each sale unit. In selected RMAs where timber will be removed for yarding corridors or the enhancement of fish and/or wildlife habitat, trees, snags, and downed woody material within buffers will be counted before and after timber harvest and site preparation according to the species and size class.

3. Management activities will be monitored, on a case-by-case basis, to determine if BMP standards (see appendix 2-A) are being met. Monitoring of riparian zone condition will occur periodically to identify any unanticipated impacts resulting from management activities, such as ORV use, minerals exploration and development, and prescribed fire. The information obtained from monitoring will be used in allotment evaluations and in the development of mitigating measures and BMPs. Riparian zones will be periodically monitored to determine if stream banks are being maintained in stable condition along at least 90 percent of a stream's length in any given drainage.

   Riparian vegetation will be monitored periodically through the range land monitoring program to determine if levels of utilization by livestock are within standards established in activity-level grazing management plans (AMPs, etc.). Grazing management practices in riparian zones will be evaluated to determine if regrowth of riparian plants is occurring or sufficient vegetation for maintenance of plant vigor and stream bank protection is being left after use.

Costs

An estimated $10,000 annually.

Retention of Wildlife Trees

Expected Future Conditions and Outputs

Maintain 185 snags per 100 acres (mixed conifer stands), well distributed within harvested units to provide habitat for cavity nesters. Mixed conifer stand wildlife trees should have a diameter of at least 20 inches (or if 20 inch trees are unavailable, a minimum diameter of 10 inches), and should be at least 30 feet high. Maintain 135 snags per 100 acres (ponderosa pine stands), well distributed within harvested units to provide habitat for cavity nesters. Ponderosa pine wildlife trees should have a diameter of at least 14 inches (or if 14 inch trees are unavailable, a minimum diameter of 10 inches), and should be at least 30 feet high. Maintain habitat for cavity-nesting species at 60 percent of potential dominant woodpecker population levels or higher.

Monitoring Questions

1. Are suitable (numbers, heights, and diameter classes) snags and replacement trees being left, suitably distributed, to achieve the habitat necessary to attain the 60 percent population level?

Standards

Every five years the population level of dominant woodpeckers sustainable by BLM habitat will be assessed using the analytical technique used in the RMP/EIS to assess the capability of the alternatives. In addition, 20 percent of regeneration harvest timber sales units will be examined by pre- and post-harvest (and after site preparation) inventories to determine snag and green tree numbers, heights, average diameters, and distribution within harvest units. Wildlife trees left following timber harvest activities (including site preparation for reforestation) will be compared to those that were marked prior to harvest.

Costs

An estimated average of $15,000 annually.

Rocky Mountain Elk

Expected Future Conditions and Outputs

Elk numbers will remain stable (as identified in RMP range allocations) or build. Range conditions will stabilize.

Monitoring Question

1. Are elk herds on BLM-administered lands stable or increasing?

2. Are range conditions stable or is there obvious competition between resources?

Standards

Trend routes on elk emphasis areas will be monitored (in conjunction with ODFW) every year. Range monitoring (cole browse transects) will be conducted to identify potential problems.

Costs

Yearly helicopter cost for winter surveys, $1,000. Summer range survey, $3,000 annually.

Special Habitats

Expected Future Conditions and Outputs

Maintenance of undisturbed conditions in each special habitat (such as meadows, wetlands, and cliffs/talus slopes), plus undisturbed conditions in buffers at least 100 feet wide around dry meadows, and wooded swamps.

Monitoring Questions

1. Is BLM protecting special habitats as provided in the RMP?

2. Is the average width of undisturbed buffers retained following timber harvest and site preparation activities as specified in the RMP?

Standards

Twenty percent of BLM actions on lands containing or near special habitats will be examined to determine whether special habitats were protected as provided for in the RMP. Determine average buffer widths by measurement at approximately equidistant points around the affected unique habitat within each sale unit.

Costs

An estimated $13,000 annually.

Fish Habitat

Expected Future Conditions and Outputs

Maintenance and enhancement of fish habitat with diversity and quality capable of maintaining or enhancing populations of resident salmonoid game and priority nongame fish species.

Improvement of spawning and rearing habitat and increase of large woody debris levels.

Monitoring Questions

1. Is fish habitat in terms of quantity and quality of rearing pools and over-wintering habitat, and fingerling production being maintained or improved as predicted?

2. Is large woody material being retained in the stream channel for fish habitat?

Standards

1. All streams supporting resident trout will be sampled once every ten years for changes in riparian and instream habitat conditions and fish populations.

2. Warm water fisheries - fish and lakes will be monitored and stocked if necessary.

Costs

An estimated $13,000 annually, plus initial costs for equipment of $3,000.

Special Status Species

Expected Future Conditions and Outputs

Conservation or recovery of special status species and their habitats so that listing under the Endangered Species Act (ESA) is not needed.

Monitoring Questions

1. Are BLM actions and BLM authorized actions designed and executed to protect or enhance special status species and/or their habitat to the extent required by the ESA, Bureau policy, or as directed in the RMP?

2. Are the mitigation and protection measures employed effective?

Standards

1. Annually 20 percent of the files on each year's timber sales, range improvements, grazing decisions, and other relevant actions (such as rights-of-way, instream structures) will be reviewed to evaluate documentation regarding special status species and related recommendations and decisions in light of ESA requirements, policy and RMP decisions. If mitigation was required, review will ascertain whether such mitigation was incorporated in the authorization document. The relevant actions will be reviewed on the ground after completion to ascertain whether the mitigation was carried out as planned.

2. Habitat conditions will be monitored at all or a representative sampling of known sites of all listed, proposed, candidate, State listed, and Bureau sensitive plant and animal species identified as occupying sites potentially affected by Bureau actions, both before and within a year after site disturbance and/or at intervals of at least five-years. Population trends of plants in those categories at such sites will also be monitored. Such monitoring will particularly evaluate effectiveness of mitigating measures.

3. Northern spotted owl populations will be monitored throughout their range on BLM-administered land. Monitoring will consist of demographic studies and density studies. Both will follow the standards and guidelines established by an interagency group on May 4, 1990, or any agreed-on updates.

   The Surveyor Mountain density study area will be designed to determine the total density of northern spotted owls within a specified area, and will last for the life of the plan. This study will be a very intense census to establish a density estimate for a point in time and track timber management activities in relation to northern spotted owls. Density studies involve locating all northern spotted owls within the area boundaries, determining reproductive success, banking, and rechecking areas on an annual basis for the duration of the study. They will be designed to encompass an area of similar habitat condition (such as highly fragmented, younger age).

Costs

An estimated $2,000 annually for number one. Number two plants, approximately $2,000 per site each year visited. Number three, northern spotted owls, $300,000 annually.

Areas of Critical Environmental Concern (ACECs)

Expected Future Conditions and Outputs

Maintenance of ACECs in accordance with the objectives established for them, to protect the values for which they were designated.

Monitoring Questions

1. Are BLM actions and BLM authorized actions consistent with RMP objectives for designated ACECs?

2. Are the special values of ACECs being maintained?

3. Has a baseline inventory of relevant values been conducted? What is their present condition?

Standards

1. All actions within and adjacent to ACECs will be reviewed to determine whether the possibility of impacts on ACEC values was considered, and whether any mitigation identified as important for maintenance of ACEC values was required and, if so, was actually implemented.

2. Each ACEC will be monitored annually to determine if unauthorized uses are occurring and whether ACEC values are being maintained.

Costs

An estimated average of $3,000 annually.

Visual Resources

Expected Future Conditions and Outputs

Preservation of existing visual qualities in all areas designated by the Congress for exclusive management (such as VRM Class I areas) and conservation of visual qualities in areas within 1/4 mile of recreation sites, highways, state scenic waterways, and wild and scenic rivers (such as VRM Class II and III areas).

Monitoring Question

1. Are management actions (primarily timber sales) in VRM Class II and III areas meeting or exceeding visual resource management class objectives?

Standards

All timber sales and other selected projects in VRM Class II areas and 25 percent of sales or projects in Class III areas that have special design features or mitigating measures for visual resource protection will be monitored to evaluate the effectiveness of the practice used to conserve visual resources. The method will consist of a post timber harvest or project construction visit to evaluate success or failure based on professional judgement. In VRM Class II management areas, where two or more sales or actions have occurred, impacts will be monitored to determine total cumulative impacts at a minimum interval of five years.

Costs

An estimated $2,000 annually.

Reforestation and Timber Management Practices

Expected Future Conditions and Outputs

Timber sale levels are as projected in the RMP/EIS. Design and logging of timber sales under the restrictions of the RMP is feasible. Harvested units are reforested at a stocking level, with growth and yield, that will achieve projected outputs.

Monitoring Questions

1. Are timber sale volumes and harvest acres as projected in the RMP/EIS?
2. Has the BLM been able to design and sell timber sales that meet the standards set forth in the RMP, on all categories of lands where sales were expected during the life of the plan?
3. Were the acres receiving management practices (such as planting with genetically selected stock, fertilization, release, and thinning) as projected in the RMP/EIS?
4. Is reforestation achieving desired stocking, particularly in migration and dispersal areas?
5. Are stands growing at a rate that will produce the predicted yields?

Standards

1 and 3. Annual timber sale volumes and acres to be harvested will be identified in annual work plan accomplishment reports.

2. An annual post mortem will address whether the resource area was able to offer and sell timber sales that meet RMP standards.

4. First, third, and fifth year stocking surveys will be used.

5. Managed stand inventory (as part of the decadal forest inventory) will provide actual growth data to be reported once every 10 years.

Costs

An estimated $18,000 annually.

Rural Interface Areas

Expected Future Conditions and Outputs

Bureau of Land Management land within 1/4 mile of identified rural interface areas zoned for 1- to 20-acre lots is managed in such a manner as to mitigate adjacent land owner concerns when reasonable to do so. Forest management practices are altered when reasonably feasible.

Monitoring Question

1. Are we managing rural interface areas consistent with management practices identified for these areas in the RMP?

Standards

All actions within 1/4 mile of the identified rural interface areas will be examined to determine if special project design features and mitigation measures are implemented as planned.

Costs

An estimated $4,000 annually.

Grazing Management

Expected Future Conditions and Outputs

The livestock grazing program will be managed under the principles of multiple use, and sustained yield. Monitor the existing grazing allotments in compliance with the established monitoring plan for the Klamath Falls Resource Area. Make any needed adjustments within grazing allotments using monitoring data. This will be completed through a team of interdisciplinary resource specialists to meet identified allotment objectives identified in the Preferred alternative.

Monitoring Questions

1. Are allotment goals and objectives being achieved with current management as specified on a allotment basis?
2. Are current grazing systems effectively enhancing riparian and wetland sites as emphasized within the Preferred alternative?
3. Is ecological condition improving from areas of early to mid, late, and, in some cases, Potential Natural Community depending on resource objectives?

Standards

Use approved Bureau monitoring techniques to analyze present management systems. Monitoring is a tool to see if resource goals and objectives are being met.

Evaluate allotments based on their priority and selective management categories with established time frames found in the Oregon Range Land Monitoring Handbook, Klamath Falls Resource Area Monitoring Plan, Bureau regulations, and technical references. Make adjustments as necessary based on this information.

Riparian and Wetlands will be managed to meet stated objectives for wildlife and fisheries. Monitoring of these areas will be the key in the timing used for moving livestock.

Costs

An estimated $40,000 annually is needed in the Klamath Falls range program for the life of the plan to accomplish stated RMP objectives.

Socioeconomic Conditions

Expected Future Conditions and Outputs

Contribution to local employment and county revenues by providing outputs that support approximately 118 jobs and $554,096 annually of payments to the O&C counties.

Monitoring Question

1. What level of local employment is supported by BLM timber sales and forest management practices?
2. What were O&C payments to counties?

Standards

1. Using current multipliers, annual BLM timber sales and harvest volume will be related to supported employment. Similarly, labor-intensive management practices each year will be related to jobs.
2. Annual O&C payments will be reported.

Costs

An estimated $1,000 annually.

Appendix 2-J
Research

Introduction

This appendix contains a list of research topics the BLM proposes to address as part of its management planning process. The following list is considered dynamic and may be modified after completion of the RMP, to reflect evolving knowledge and priorities:

Proposes Research Topics

Water

Refinement/evaluation of a cumulative impact analysis model to assess effects of various management activities (including identification of hydrologic recovery rates) in third-order to fifth-order watersheds. Identifying the roles of first and second-order streams on the overall productive capability of the aquatic ecosystem, and the effect of different management prescriptions.

Biological Diversity

Assessment of silvicultural tools for enhancing biological diversity while at the same time producing merchantable products.

Development of methods for measuring diversity in forest stands.

Assessing the effects of natural fires, prescribed fire, and fire exclusion on biological diversity.

Wildlife

Defining habitat requirements and preferences of amphibians and reptiles (particularly those that are special status species).

Identifying how management activities affect those species and what management prescriptions can minimize impacts on them.

Identifying how northern spotted owls respond to alternative timber harvest prescriptions.

Identifying how landscape-level habitat patterns in the checkerboard ownership pattern affect northern spotted owl occupancy, reproduction, survival, and juvenile dispersal.

Identifying the vegetation structure characteristics and histories of forest stands used by northern spotted owls as foraging habitat.

Riparian Zones

Assessing the effect of different buffer widths and compositions, and the influence of differing management prescriptions on adjacent lands, on the plants and animals of the riparian zone.

Fish

Assessing the effects of different management prescriptions on specific fish habitat characteristics as well as fish populations.

Assessing the effects of fish habitat improvement projects on aquatic invertebrate fish food sources, as well as fish populations, and the useful life of the projects.

Forestry

Assessing reforestation success and growth of stands managed by different prescriptions.

Appendix 3

Appendix 3-A
Soil Resources

Introduction

The ability of the land to grow trees, the location and condition of the trees, and the growth rate and present volume of the trees is information that is necessary when preparing land use plans. The BLM obtains this information primarily through three inventory systems, the Timber Production Capability Classification (TPCC), Operations Inventory, and Forest Reinventory. This appendix describes these inventory procedures.

Forest Inventory

Timber Production Capability Classification

The Timber Production Capability Classification is an intensive inventory process initiated in 1972 to categorize all BLM-administered land in Oregon based upon the land's physical and biological ability to grow trees. The TPCC was conducted in accordance with Oregon BLM Manual Supplement 5250.

In 1976 a west side TPCC inventory identified high intensity commercial forest land that could be managed on a sustained yield basis. This land formed the potential timber production base for computation of the annual allowable sale quantity. Approximately 37,160 acres were identified in this category. The TPCC also identified 2,560 acres of low intensity commercial forest land determined to have a regeneration period longer than five years, but potentially harvestable without site deterioration. Commercial forest lands with severe regeneration problems and fragile soils (1,960 acres) were classified as limited management lands. Sites were placed in this category only when it was judged that economically reasonable technology was not available to mitigate such deterioration. Low intensity management and limited management lands were excluded from the normal potential timber production base for computation of the annual allowable sale quantity. The remainder of the west side's 8,960 acres were classified as either non-forest or noncommercial forest.

In 1986 the Oregon State Office issued Handbook 5251-1 Timber Production Capability Classification, which replaced the 1972 Manual Supplement used in 1976 and 1984.

The 1984 east side TPCC, updated in 1988, identified 16,210 acres as suitable commercial forest land. The inventory also identified suitable woodland with classifications of low site (20 acres), nonsuitable commercial forest land with harsh sites and long regeneration periods (3,960 acres), and noncommercial species (54,990 acres of juniper woodland). The remaining 88,840 acres were classified as non-forest. Table 3-29 in chapter 3 displays how KFRA lands were classified in 1988.

The land base used for computation of potential allowable sale quantities (ASQ) using the two TPCC systems are not directly comparable. The 1988 system contains two woodland classifications that did not exist in 1976. Each of the woodland categories could be components of the ASQ. By contrast, the 1976 system by definition withdrew from planned harvest lands classified as non-forest land, low site, and noncommercial species.

The TPCC Handbook is available for inspection during normal working hours at the Klamath Falls Resource Area office, and provides a complete description of the classifications.

Operations Inventory

For BLM to carry out a timber management program effectively, specific information as to the location and current condition of the various forest types within the land base must be available to managers. This is accomplished through the Operations Inventory (OI) in accordance with procedures contained in the Operations Inventory Handbook.

The OI is an intensive inventory which divides the forests into survey units sufficiently uniform in composition, condition, operability, productivity, or other characteristics to distinguish them from adjacent units. Information on each unit is maintained in the MICRO*STORMS computer system. Each survey unit has information on location, acreage, stand condition, past management, silvicultural needs, and opportunities for application of intensive management practices.

Forest Reinventory

The purpose of the extensive inventory is to determine the present volume of the trees in the district. A reinventory of commercial forest land was completed in 1988 employing procedures developed jointly by the USFS and BLM. The reinventory used the same basic inventory design applied during preparation of the present management plan. The inventory is a stratified, random sample of the commercial forest land base. Each plot is a cluster of five sample points for west side lands and ten sample points for east side lands. Each point is the center of both a fixed and variable radius plot. The objective of the inventory is to estimate the total coniferous volume within plus or minus ten percent (two standard deviations).

The volume on present stands is derived from permanent, continuous forest inventory plots. Inventory plots are stratified based on site index, age, and major TPCC category (suitable commercial forest land, suitable woodland, non-suitable woodland, and non-forest).

More information on these inventory systems is available from the KFRA office.

Appendix 3-B Water Resources

Introduction

This appendix consists of four sections: Summary of Basic Hydrologic Principles, Cumulative Watershed Effects Analysis Procedures, and Watershed Condition Index Methodology. These sections describe many of the principles and procedures used in the management of water resources in the Klamath Falls Resource Area (KFRA).

Summary of Basic Hydrologic Principles

Water Quantity

Oregon's latitude, topography, and location near the Pacific Ocean have a great influence upon its climate. The Coast and Cascade ranges play a major role in determining precipitation type and distribution. The prevailing air masses that move across Klamath County from the Pacific Ocean have been greatly modified as a result of their passage over the Cascade Range. Continental air masses that move down from the interior of western Canada are also a major weather factor. See the Climate section of chapter 3 for more information.

Precipitation is an important climatic variable that influences the productivity and management of resource lands. Estimates of precipitation are used for planning numerous forest management activities, such as the location, design, and maintenance of roads, and the selection and scheduling of harvesting and reforestation systems.

Interception occurs when rain or snow lands on vegetation rather than the ground. Some of this intercepted water evaporates and the remainder falls to the ground. Water also evaporates from the surface of water bodies and soil. Under forested conditions, evaporation from soil surfaces is minimal. Transpiration is the process in which water is taken up by plants and then evaporates into the atmosphere.

Infiltration is the movement of water into the soil surface. When the rainfall rate exceeds the infiltration rate, water will travel over the ground surface, as surface runoff, to a channel. Infiltration rates in forest soils of south central Oregon usually exceed the maximum rates of rainfall, thus allowing most of the water that reaches the earth's surface to enter the soil.

Soil compaction may significantly change the hydrology of a watershed by reducing infiltration rates and increasing surface runoff. Infiltration rates are reduced by soil disturbance and compaction associated with timber harvest activities when roads, tractor skid trails, and landings are built to remove timber. Compaction may also be caused by site preparation following timber harvest. Other changes in hydrology occur from the routing of runoff through culverts and ditches which causes rapid delivery of water to stream channels, possibly increasing the size of peak flows. Increases in peak flows appear to be related to the amount of soil compaction in a watershed, and can cause increased channel degradation and downstream sedimentation.

Soil compaction and ground cover removal can cause increases in surface runoff, which can affect the amount and timing of peak flows. Reductions in ground cover can be the result of wildfire, prescribed burning, site preparation (such as scarification) and grazing. Grazing removes protective ground cover and disturbs litter and soil, while trampling by grazing animals compacts surface soils. The amount and timing of peak flows from runoff is thought to be positively correlated with the intensity of grazing within a drainage. Adverse impacts to riparian vegetation from grazing can negatively affect the hydrology of a stream because riparian zones contribute to groundwater recharge and maintenance of flows.

Streamflow

The amount of water draining from a given area in a year is referred to as the annual water yield and is usually expressed in acre-feet (1 acre-foot equals 43,560 cubic feet) or the average depth over an area in inches. The annual yield of an area can be converted to the average annual flow (in cubic feet per second) of the stream draining the area.

Streamflow is the water that reaches the stream channel. Total streamflow is a product of all the other processes in the hydrologic cycle. Distribution of annual streamflow in south central Oregon is related to the distribution and type of annual precipitation; thus, in the planning area high flows are observed during the spring and low flows are predominant from July through October. Below normal precipitation in the planning area from 1985 through 1991 has contributed to extremes in summer low flows. Naturally low summer flows, when combined with withdrawals for irrigation or other consumptive uses, can have a serious impact on other beneficial uses.

Timber management activities, such as road construction, harvest, and slash disposal, affect streamflow because they remove forest vegetation. Removal of forest vegetation reduces the amount of precipitation that returns to the atmosphere from interception and transpiration. More precipitation reaches the soil surface and drains into streams or becomes groundwater. Increases in streamflow may cause more frequent flooding, leading to decreased stream bank stability and increased movement of sediments.

The amount of streamflow increase resulting from removal of forest vegetation is proportional to the type of harvest, the area harvested within a specific watershed, and the time since harvest. Streamflow increases are most noticeable in small watersheds that have large areas of vegetation removed over a short time period. Streamflow increases in large basins tend to be masked, because the nonvegetated area is small relative to the size of the basin.

Increases in streamflow due to vegetation removal are not distributed evenly throughout the year. Summer streamflow increases result from greatly reduced transpiration which allows more water to drain through the soil to the streams. Increases in summer flows appear large when compared to the naturally low levels during the summer months. Summer increases are relatively short-lived because of the growth of vegetation along stream channels. Seasonal changes in streamflow following timber harvest are also linked to seasonal differences in soil water content between forested and harvested areas.

The duration of increased streamflow after removal of vegetation is not easily predicted; however, Harr (1983) found that 27 years would be required for streamflow increases to disappear. The return of vegetation results in annual streamflows decreasing to preharvest levels as both interception and transpiration increase. Evaporation from the soil surface is generally increased after timber harvest; however, this increase is offset by the reduction in transpiration.

The magnitude of peak flows can be increased by timber harvest in the transient snow zone, which is located at elevations where the snow level fluctuates in response to alternating warm and cold fronts. The transient snow zone in the planning area is generally between 2,500 and 4,500 feet. Snow accumulation is greater in clearcut openings than in undisturbed forests. Rain-on-snow events result in rapid melting of the snowpacks in clearcut areas, resulting in more snowmelt being generated from clearcut openings and larger peak flows. However, timber removal is limited in its effect on the size of large peak flows, which cause extensive downstream flooding during heavy precipitation. When large peak flows (floods) occur during such heavy precipitation, the difference in soil moisture content between forested and harvested areas becomes insignificant, and the hydrologic behavior of each area becomes nearly identical. Soil disturbance may have an influence on the frequency and magnitude of small and large peak flows. The degree of influence depends upon the amount of area compacted by roads and tractor skid roads, and the proximity of the compacted area to stream channels.

Water Quality

Sediment, stream temperature, turbidity, dissolved oxygen, and chemical composition are important water quality components that indicate the level of protection of the beneficial uses within a watershed. The state's water quality requirements pertaining to BLM management practices in the planning area are the requirement for the highest and best practicable control of waste activities [Oregon Administrative Rules (OAR) 340-41-965(1)], water temperature [OAR 340-41-965(2)(b)], turbidity [OAR 340-41-965(2)(c)], coliform [OAR 340-41-965(e)], and the antidegradation policy (OAR 340-41-026). The Oregon Department of Environmental Quality (DEQ) is reviewing and proposing changes to its water quality requirements, of which several (the antidegradation policy, dissolved oxygen, temperature, coliform, and turbidity) relate to BLM land management practices.

Streams flowing from undisturbed forests generally have excellent quality. This characteristic makes streams valuable for domestic water supply, fish production, and recreation. Natural processes such as surface erosion, landslides, and flood events can increase sediments in stream channels, causing a detrimental effect on water quality.

Units of Measurement

Most chemical parameters of interest, as well as most sediment data, are reported in terms of concentrations, discharge, or yield. Water quality data is usually reported as concentrations or weight per unit volume, usually milligrams per liter (mg/l) or micrograms per liter (ug/l). In generally high-quality waters, mg/l equals parts per million (ppm), and ug/l is equivalent to parts per billion (ppb). Sediment and chemical data may be expressed in terms of discharge (weight or volume per unit time, tons per day, or cubic feet per year) or yield (weight or volume per unit area of the watershed, such as tons per acre, acre-feet per square mile, or kilograms per hectare). Water temperature is measured in degrees Fahrenheit or degrees Celsius; turbidity is measured in Jackson or Nephelometric Turbidity Units (JTUs or NTUs); conductivity is measured in microsiemens (Us), which are numerically the same as micromhos; and bacteria are measured in number of organisms per 100 milliliters (ml).

Stream Temperature. The primary concern with increases in water temperature is the potential for detrimental effects on fish and other aquatic organisms. Optimum water temperatures can be attributed to both natural and man-induced factors. Natural factors include low summer flows resulting from minimal to no precipitation during the summer, high summer air temperatures, wide channels, stream orientation, and geology. Stream temperatures may be affected if shading vegetation from stream banks is removed during timber harvest. Livestock grazing may cause water temperature increases by removal of stream-shading vegetation and the widening and shallowing of the stream channel by stream bank damage. Because downstream shading does not significantly lower temperatures of streams warmed by upstream exposure, water temperatures of large streams also increase if small tributaries are exposed to solar radiation. The magnitude of this effect is dependent on the temperature and quantity of groundwater inflow, as well as inflow from other well-shaded tributaries.

Sediment and Turbidity. Sediment, or particulate matter, is described as suspended and settleable solids of organic and inorganic nature. Sediment can cause adverse effects when suspended in the water column or when deposited on the substrate. Some of the common measurements of sediment are turbidity, suspended sediment, settleable solids (wash load and bed load), and percent accumulated fine materials. Water quality requirements are usually set in turbidity units rather than in terms of sediment amounts. The general criteria established by the Environmental Protection Agency (EPA) is that "settleable and suspended solids should not reduce the depth of the compensation point for photosynthetic activity by more than 10 percent from the seasonally established norm for aquatic life" (EPA 1986). Chapter 340 of the OAR sets a standard of no more than a 10 percent cumulative increase in natural stream turbidities to be allowed, as measured relative to a control point immediately upstream of the turbidity-causing activity.

Turbidity is the measurement of the optical property which causes light to be scattered and absorbed. Turbidity is commonly measured in JTUs or NTUs. There is no direct relationship between the two methods; therefore, there is no direct method of converting JTUs to NTUs or vice versa. Turbidity can impair salmonid sight-feeding ability, reduce growth in salmonids, decrease primary productivity by reducing light penetration, and can contribute to an increase in stream temperature due to increased absorption of radiant energy.

Suspended sediment refers to that portion of the sediment load which is suspended in the water column. Suspended sediment clouds water and can cause fin and gill damage in adult fish. Deposition of suspended sediment in lower gradient stream reaches (such as pools and slower moving streams) clogs interstitial spaces in cobble and rubble fish habitat and can reduce pool volume, which in turn lowers production of fish, macroinvertebrates, and most other aquatic life. Suspended sediment also increases the cost of treating drinking water. Chemicals, such as pesticides, and nutrients often bind to sediment particles, thus they may be retained in the stream system rather than being flushed downstream.

Instream sediment levels are both transport (flow) and supply dependent. Paustian and Beschta (1979), Jackson and Beschta (1982), and VanSickle and Beschta (1983) described bedload transport in terms of supply of material available for transport at various levels of flow; they found that most bedload transport occurred during short periods of high water, when flows were sufficient to entrain coarse, armoring riffle sediments, and access supplies of finer

material within the riffle. Subsequent studies (Jackson and Beschta 1984) have demonstrated that increased amounts of sand in transport can cause previously stable, coarse riffle sediments to undergo scour. Stream bank erosion may also be a result of these peak flows. Increased high flow events would cause increased sediment concentrations and more frequent episodes of riffle scour and fill.

The effects of management activities on sediment transport is directly related to the effects on high flow events. The effect of management activities on the supply of sediment available for transport depends on the average slope of the sediment contributing area and the type of erosion processes dominant in the area of the activity. On gently sloping topography with competent (erosion resistant) bedrock, little, if any, increased erosion would be expected (Harr and Fredriksen 1979) as a result of management activities. On steeper slopes, surface erosion (known as dry ravel) occurs, especially after slash burning. It is not known how much of this eroded material reaches streams and becomes sediment.

Soil erosion is the main source of sediment in water. Some soil is eroded naturally through the weathering processes of rain and wind. However, the main causes of soil loss are agricultural practices, timber harvesting, road and building site construction, livestock grazing, and mining activities. Harr and Fredriksen (1979) reported that mean annual suspended sediment concentration in a clearcut watershed, without roads, was about nine times the natural concentration (in an undisturbed forest), and mean annual sediment concentration in a patchcut watershed, with roads, was about 23 times the natural concentration.

Timber management (road construction, timber harvest, and slash disposal) and other ground disturbing activities can affect sediment levels in streams by increasing the capacity of the streams to entrain and transport sediment and by increasing the supply of sediment available for transport. Increases in peak flows have a direct relationship to increases in sediment transported downstream. Forestry practices may also influence the sediment entering streams through surface erosion or landslides. This influence is dependent on natural rates of surface erosion and landslide frequency, climatic factors, and the type of activity. Timber harvest operations can damage stream banks, remove vegetation with roots that strengthens streambanks, widen stream banks, and lower surface water levels during low flow conditions. In areas where debris avalanching is the dominant erosion process, clearcutting has increased the natural rate of avalanching two to four times, and road building has increased the natural rate of erosion as much as 25 to 340 times (Harr and Fredriksen 1979).

Roads continue to be a major source of stream sedimentation, although over the past 10 years improved methods for design, location, construction, and resurfacing dirt roads with rock have greatly reduced the amount of sediment contributed by roads. Surface erosion from cut and fill slopes, road surfaces, stream crossings, and drainage ditches can result in a continuous sediment source for nearby streams. Road construction can increase erosion as much as 250 times in the first storms following construction, however concentrations usually drop off between a few months and two years (Brown 1983). More extended periods of increased sediment may be associated with heavy truck road use during very wet weather, on poorly surfaced roads, or with unauthorized off-highway vehicle use.

Roads that encroach on stream channels permanently alter its flow characteristics by diverting or constricting the channel. Increased water velocities associated with constriction frequently lead to accelerated channel erosion. Road maintenance may remove riparian vegetation and disturb ditches and cutbanks that have been stabilized by vegetative ground cover. Skid roads, if located near streams, can contribute sediment if not properly waterbarred, seeded, or obliterated after use.

Livestock grazing can alter water quality by changing hydrologic conditions within a given watershed, primarily those of surface cover and soil infiltration rates. Ground cover and the area of exposed soil can have the greatest influence on surface runoff, soil erosion, and pollutant transport. Moderate to heavy grazing by livestock can decrease infiltration rates and increase surface runoff, soil compaction, soil erosion, and sediment yields. More localized impacts of grazing on water quality result from stream bank sloughing (the collapse of stream banks) and the subsequent sediment that enters the stream channel.

Mining activities may disturb large tracts of land, which can contribute to sediment problems. In addition, placer mining can involve removal of stream bank vegetation and the channelization of streams which can contribute great quantities of sediment to the channel.

Chemicals and Nutrients. Nutrients enter water mainly from treated municipal sewage discharges, failing septic tank systems, livestock operations (grazing or feed lots), and from fertilizers washed into the water by rain or irrigation. Excessive amounts of nutrients released into slow moving waters during spring and summer can result in growths of algae and aquatic weeds. Algae blooms reduce the amount of oxygen available to fish, which can result in fish kills. Shallow, nutrient-rich lakes often have impaired recreational and aesthetic values. The Water Resources section in chapter 3 discusses the upper Klamath River and the issues associated with nutrients in that water body.

To address the problem of algae growth, the Oregon Environmental Quality Commission (EQC) adopted a chlorophyll standard. The amount of chlorophyll in water indicates the amount of aquatic plant growth. Waters violating this standard will be studied by the EQC to determine the nutrient sources and options for controlling the problem.

Lakes undergo a natural aging process, which can be accelerated by human activities. This is especially true for lakes that are "old" in their stage of development, which means they have high nutrient levels and are more marsh-like. Improper agricultural, forestry, and other land use practices cause soil erosion that can introduce sediment and nutrients into the lake. This sediment can eventually fill a lake or reservoir, while nutrients could increase the frequency of algal blooms and accelerate aquatic weed growth.

Timber harvest and slash disposal can affect the nutrient status of surface water. Clearcutting can disrupt the tight nutrient cycling of an undisturbed forest system, resulting in an accelerated breakdown of forest litter from increased temperatures and water content of the site. Once trees are removed they are no longer using the available nutrients, which may then enter surface waters through leaching or soil erosion. Slash burning can accelerate this process by making additional nutrients available for transport through volatilization and ashfall of organic material. In one Oregon Cascades watershed, instream concentrations of ammonia nitrogen and manganese reached peak levels of 7.6 and 0.44 mg/l respectively following slash burning (Fredriksen 1971). Fredriksen attributed the high concentrations of ammonia nitrogen and manganese to burned slash in stream channels. However, the levels of these nutrients in streams rarely exceeds or approaches standards for those nutrients (Fellers and Kimmins 1984, Harr and Fredriksen 1988).

The aerial application of herbicides is another management activity that can affect the chemical water quality of streams. A detailed discussion of potential water quality impacts of herbicides proposed for use by the BLM may be found in the Final Environmental Impact Statement for the Western Oregon Program for the Management of Competing Vegetation (BLM 1989).

Application of nitrogen fertilizers also affects the chemical water quality of streams. Nitrogen is usually added to the soil by aerial application of urea pellets. Since direct fertilizer application is the major pathway for urea entry to streams, concentrations usually peak within one to two days following fertilizer treatment. Ammonia nitrogen also usually peaks shortly after treatment because it is a hydrolysis product of urea entering the stream.

Ammonia nitrogen in the soil is held very tightly, while nitrate nitrogen is readily leached from the soil. Leaching usually occurs after ammonia is oxidized to nitrate during the warm growing season. Therefore, peak nitrate concentrations are often recorded one to two years after fertilization. On the other hand, if nitrogen fertilizer is applied shortly after an area has burned, the warm soil temperatures may enhance nitrification and subsequent leaching of nitrate to the stream. Moore (1975) summarized several water quality monitoring studies on forest fertilization with urea throughout the Pacific Northwest and found maximum recorded nitrate values were usually less than 1 mg/l and in all cases were less than 5 mg/l.

Ammonium-based fire retardants can adversely affect water quality. Studies have reported initial retardant concentrations in water approached levels that could damage fish. Concentrations decreased sharply with time after application and distance downstream (Norris and Webb 1989).

Natural background phosphorus in streams is contributed through leaf fall and other organic material, ground water leaching, and soil eroded into streams. The use of fertilizers, fire retardants, and herbicides may, in some instances, produce small and short-term increases in stream water phosphorus concentrations. Most published studies indicate that forest management activities have only limited, if any, effects on instream phosphorus levels (Salminen and Beschta 1991).

Dissolved heavy metals found in waters polluted by mine drainage are toxic to the aquatic biota. Toxic metals commonly released by mining are arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, and zinc. Synergistic toxicity is common in waters polluted by heavy metals from mining (Martin and Platts 1981).

Dissolved Oxygen. Instream concentrations of dissolved oxygen may be reduced by excessive amounts of organic debris entering streams during timber harvest. Once this organic material enters the channel, it can adversely affect dissolved oxygen concentrations in several ways: by exerting an increased biochemical oxygen demand (BOD); by restricting flow, reducing aeration, and by accentuating water temperature increases (Ponce 1978). When fine organic debris, such as small twigs and needles, is left in a stream, the contained sugars and phenols are leached out. The degradation of these materials by microorganisms present in the steam is a process of simple oxidation. Organism growth and metabolism create an increased oxygen demand, and oxygen concentrations decrease as demand exceeds supply (Ponce and Brown 1974). Too much fine organic debris in the stream can deplete dissolved oxygen concentrations at critical times of high stream temperatures, low flows, and low available oxygen. Most of the increased BOD occurs within about 20 days of the time the material enters the stream (Ponce 1978).

Bacterial Contaminants. Bacterial contaminants most likely to be introduced into water bodies through natural processes and management activities (such as grazing and dispersed recreation) are total and fecal coliform, and fecal streptococcus. Concentrations of fecal contamination are important indicators of potential health hazards for domestic water supplies and water-contact recreation. Fecal contamination does not directly affect suitability of fish habitat, however, it can promote algal growth, which affects both fish habitat and the appearance of water. Bacterial concentrations tend to reach their peak during summer months when low flows combine with high recreation and livestock grazing use.

Macroinvertebrates are those invertebrates that can be detected with the unaided eye. Macroinvertebrates in the aquatic environment provide a link in the food chain between microscopic, multi-celled organisms and fish populations. They are essential to the growth and production of fish and because of their strict habitat requirements, are very useful indicators of aquatic habitat changes. The number, size, and species of aquatic invertebrates are important to fisheries habitat, as they are the primary food source for most salmonids and warm-water fish (Cooperrider et al. 1986).

Macroinvertebrates, particularly benthic macroinvertebrates, have several characteristics which make them useful as indicators of water quality: they have either limited migration patterns or a sessile mode of life, which makes them suitable for assessing site-specific impacts; their life span (several months to several years(is long enough to be able to be used as indicators of past environmental conditions; and the sensitivity of aquatic insects to habitat and water quality changes often make them more effective indicators of stream impairment than chemical measurements (EPA 1991).

The effects of forest management activities on macroinvertebrate communities vary. Increases in the riparian canopy opening or the amount of organic material in the stream generally enhance aquatic insect populations. An increase in fine sediment usually has the opposite effect. Removing the riparian canopy decreases the input of terrestrial organic material and the number of detritivores. However, this decline often is overwhelmed by the corresponding increase in primary production and herbivorous insects (EPA 1991).

Aquatic macroinvertebrate monitoring is a useful tool for evaluating general water quality condition and the extent to which designated uses are impaired or supported. To be most effective and reliable, however, biological studies need to be integrated into a monitoring plan that includes both physical and chemical evaluations.

For additional information regarding water resources see *Monitoring Guidelines to Evaluate Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska* (USEPA 1991) and *Study and Interpretation of the Chemical Characteristics of Natural Water* (USGS 1989).

Stream Categorization

Stream orders are being used in the RMP/EIS to determine allowable sale quantities and to analyze impacts from forest management on riparian and water resources. In the past the Klamath Falls Resource Area has managed

streams and their associated riparian zones using a stream class system that is based on beneficial uses and stream characteristics. This system is consistent with stream management practices relating to forest management on the national forests adjacent to the planning area. Stream management by beneficial use is also compatible with the DEQ's policies for protection of water quality and the Oregon Forest Practices Act. The fourth section of this appendix describes the stream class system now used by the Klamath Falls Resource Area and the associated forest management practices developed to protect riparian zones during land management activities.

The stream order system categorizes unbranching headwater stream channels as first order streams; the joining of two first order streams creates a second order stream; two second order streams combine to form a third order stream, and so forth. There is no perfect correlation between stream order and stream characteristics in the planning area (hence, the use of the stream class system by the KFRA). The following descriptions are generalizations used in identifying stream orders.

In general, first and second order streams in the planning area exhibit ephemeral or intermittent flow and are usually dry during the summer. These streams are influenced by the geomorphology, soils, and vegetation of their channels and are usually continuously shaded by vegetation due to narrow channel width. Woody debris and streamside vegetation act as energy dissipators on these steeper gradient headwater streams. These streams can have a major influence on the type and quality of downstream fish habitat because they comprise approximately 80 percent of total stream miles in western Oregon (Boehne and House 1983).

Third and fourth order streams flow year-round although many are intermittent. They are narrow enough that streamside vegetation provides continuous shade. Stream gradients may be steep, but not as steep as in first and second order channels. During winter storms, these streams are capable of moving large amounts of sediment, nutrients, and woody material downstream to higher order streams. Woody material in the channel usually provides habitat for resident fish.

The direct influence of riparian zones is moderated in fifth order and larger streams but remains important. Channels tend to be wider and have flatter gradients than the lower order streams. Canopies of large, old growth trees provide some shade; vegetated riparian zones keep the main channel confined; and large tree stems remain in the stream to provide important fish habitat. Flood plains of larger streams contain multiple side channels, overflow channels, and isolated pools. Side channels are often created and maintained by large woody debris (Bisson et al. 1987, Sedell et al. 1984). Alluvial material and woody debris may be deposited in quiet areas, but accumulations are flushed and rearranged during high flows (Sedell et al. 1988).

Riparian Zones

Riparian areas are critical to the regulation of stream flow and to water quality protection. Healthy riparian vegetation provides hydrologic benefits through water quality enhancement, attenuation of flood peaks, erosion control, and increased storage of water in stream banks. Riparian zones are often discharge points in the groundwater flow system. Vegetation and other structures in riparian zones help maintain water quality by trapping sediment and organic matter, and help regulate stream temperatures by shading streams from solar radiation.

Stream riparian zones have important geomorphic and hydrologic roles that support their high level of biological productivity. The most productive stream riparian zones are often associated with alluvial stream systems. A major role of riparian zones in these systems is to function as a flood plain and dissipate stream energies associated with high flows. This permits sediments to deposit and continue development of the alluvial valley floor.

Alluvial riparian zones also function as shallow aquifers that recharge during high flows and drain during low flows. This interaction between surface flow and groundwater storage results in moderated high flows and enhanced or prolonged base flows. The shallow aquifer condition also creates the moist soil conditions required for plant growth characteristic of riparian zones.

It is the geomorphic and hydrologic characteristics of riparian zones that establish the basic components of biological habitat. These components include wet soils and instream structural features, such as pools, riffles, gravels, and streambanks. The vegetation that thrives in riparian zones contributes to their proper geomorphic and hydrologic functioning. Disruption of normal geomorphic or hydrologic function, or the vegetation on which it depends, usually results in impairment of overall riparian resource values.

Stream channel characteristics change as surrounding vegetation develops through various seral stages, starting with the early seral stage and ultimately developing into a mature stand of climax vegetation. Flood events play a major role in the development of streamside vegetation and channel characteristics. Vegetation and soil type on the adjacent uplands regulate water retention and runoff which influences water quality and quantity in the channel.

Geomorphic structure, such as pools and flood plains, strongly influences stream and riparian ecosystems. This is particularly true in steep, mountain valley floors typical of the Coast Range and western slope of the Cascades where floods and debris flows can (over a few years or decades) damage riparian vegetation and alter aquatic habitats.

The frequency and extent of disturbance, accessibility of riparian zones to wildlife, and magnitude of vegetation influence on stream ecosystems varies as a function of drainage area and the associated variables of stream channel and valley floor widths. Another important source of structural variability along streams are exogenous (nonfluvial) factors such as bedrock outcrops and large hillslope landslides. Areas of very narrow valley floors can occur along headwater channels in V-shaped valleys or in bedrock or landslide-controlled gorges along larger channels. Such areas may have extensive topographic shading and little riparian habitat. In wider valley floors channels can move laterally, creating complex mosaics of vegetation and secondary channels rich in aquatic and terrestrial habitat. If only fluvial processes have formed valley floor landforms and there has been no significant influence from variation in bedrock hardness, hillslope landslides, or other exogenous factors, valley floor and channel widths are likely to increase uniformly in the downstream direction. Channel and valley floor conditions may vary greatly from one geologic terrain to another (Hansen et al. 1988).

A buffer zone of three or more tree heights (approximately 400-500 feet) is required to protect streamside riparian zones from changes in microclimate and wind damage that can threaten the integrity of vegetative structure, species composition, and wildlife values (ODFW 1991). Microclimate impacts to riparian zones include increased water temperature from solar radiation and from elevated air temperatures contacting water surfaces. Water temperature increases of up to 20 degrees Fahrenheit have been documented in western Oregon (Levno and Rothacher 1967). Another microclimate change is caused by reduced humidity, which can cause compositional changes in vegetative species. This can alter a food chain based on decaying leaves and benthic invertebrates, which has potential impacts to fisheries.

Subterranean invertebrates thrive in a maze of channels that flow among the gravels, sands, and rock that underlie many streams and rivers. These underground waterways can be as deep as 30 feet and can extend sideways for miles from the stream channel. In this understream area, called the hyporheic zone, live small blind shrimp, primitive worms, bacteria, algae, and various immature insects. These underground animals support a food chain that extends to the surface. The hyporheic zone serves as a refuge for creatures during times of drought, stress, and/or floods. After such events, streams may rely on the underground life to assist in repopulation of aquatic invertebrates. The underground system is rich in bacteria that fix nitrogen, which is in great demand by surface organisms.

Timber management activities (road construction, timber harvest and slash disposal) remove riparian vegetation, constrain natural stream channels, and alter stream banks and channel structures at stream crossings.

Debris torrents, often caused by clearcut timber harvesting techniques and/or by road construction in very steep terrain, can scour stream beds down to bedrock, damage riparian vegetation, and eliminate the ability of riparian zones to store water as shallow aquifers. It is sometimes necessary during timber harvests to yard logs through riparian zones; this can cause damage to riparian vegetation and stream banks. Timber harvests can also result in long-term reductions in the amount and size of large woody debris, and both large and fine organic matter, that enter a stream channel. Replacement of large woody debris in riparian zones following timber harvest is a slow process, which depends on the following: the volume of pre-harvest woody debris that remains in the channel following logging and the rate at which it decomposes or is transported from the site during freshets; the volume of debris that enters the channel during logging and is not removed; the rate at which the riparian zone progresses through site-specific seral stages and; the frequency of additional periodic disturbance at the site, including the number and diameter of trees removed. Following timber harvest or other site disturbance, at least 120 years may be required for streamside riparian vegetation to return to woody debris levels (amount of wood with sufficient length and volume) that approximate stream channel conditions in undisturbed timber stands (Heiman 1988). Full recovery may take at least 200 years (Franklin et al. 1981). Changes in species composition and vegetative structure can be permanent if the area is subjected to additional periodic timber harvest. Timber harvest on private and public lands

throughout the planning area has fragmented the few stands of stream-associated riparian habitat that remain undisturbed by management activities.

The physiological needs of riparian vegetation are generally not met in standard livestock grazing systems. Riparian habitats require more intensive management to protect their values than the adjacent upland areas. Concentrations of livestock along streams can cause stream bank sloughing, loss of riparian vegetation, and loss of aquatic productivity. Use of riparian vegetation by livestock too early in the season can result in stream bank hoof shearing. When livestock grazing begins during spring runoff the season's vegetative growth could be inadequate to protect stream banks and filter sediment. Grazing in riparian zones, when soil moisture is greater than ten percent, can damage banks and cause soil compaction, impairing growth of the riparian vegetation. However, early season use provides more opportunity for regrowth and plant recovery than summer or fall use. Regrowth is important in sustaining the important physical functions of a riparian system (shading, insulation, sediment filtering) and for buffering the effects of peak runoff on stream banks. Use by livestock later in the season may leave streamside vegetation depleted and banks vulnerable to damage during the following spring runoff. Utilization of willow by livestock before carbohydrate storage is complete can be detrimental to willow growth and regeneration.

Sometimes livestock use is not compatible with a management objective of improving riparian habitat because of livestock grazing habits or the sensitivity of the riparian zone. Exclusion of livestock from the riparian area may then be required. However, alternatives to exclusion fencing have proven successful for the improvement and recovery of riparian zones in the planning area. See the Riparian Zone section in chapter 3 for more information.

In January 1991 the BLM released its national plan for managing riparian-wetlands on public lands. Called the *Riparian-Wetland Initiative for the 1990's*, the plan sets a series of goals and strategies to achieve healthy conditions on BLM-managed riparian zones and wetlands. One goal set forth in the plan is to restore and maintain riparian-wetlands so that 75 percent are in proper functioning condition by 1997. Proper functioning condition was defined in terms of the interaction of soil, water, and vegetation in those areas. Riparian-wetland areas are considered to be functioning properly when adequate vegetation is present to: dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality; filter sediment and aid floodplain development; improve floodwater retention and groundwater recharge; develop root masses that stabilize streambanks against cutting action; develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and support a greater biodiversity. Improvements in riparian condition have already been made in the planning area through the implementation of special protective measures and management prescriptions for BLM activities in riparian zones.

Groundwater

Water that infiltrates the soil surface is known as groundwater. Most groundwater eventually discharges into stream channels, although some groundwater is found in layers called aquifers (water-bearing rocks or sediments that occur at depths from a few feet to several hundred feet below the surface). There are two types of aquifers: unconfined (also known as water table aquifers) and confined (also known as artesian aquifers)(see figure B-1). Unconfined aquifers are generally shallow with an impermeable layer of rock or soil defining the lower boundary. The water table (saturated zone) is located between the impermeable layer and land surface. These shallow, unconfined aquifers are prone to contamination from surface pollutants. Confined aquifers are very deep below the soil surface and are separated from the surface by an impermeable layer of rock or soil. The quality of water in confined aquifers is generally excellent; however, in some cases, chemicals in the subsurface geologic formations can add undesirable contaminants, such as arsenic, boron, or sodium.

Groundwater is replenished by rain and snow, which filters through soil and geologic formations. This underground water generally moves slowly from mountains and uplands to lowlands and valleys, where it is discharged to creeks, rivers, and marshes, and provides the base flow for streams throughout Oregon. The discharge may vary significantly in different areas, depending on the nature of the aquifer.

Water tables generally rise after removal of vegetation due to increased water (from reduced transpiration) recharging groundwater areas. However, reductions in groundwater may occur when subsurface flow is intercepted by road cuts and transformed into surface water through a ditch-culvert system. Some of this water is deposited on undisturbed soil areas where it returns to subsurface flow. The remainder is deposited into channels where it becomes streamflow.

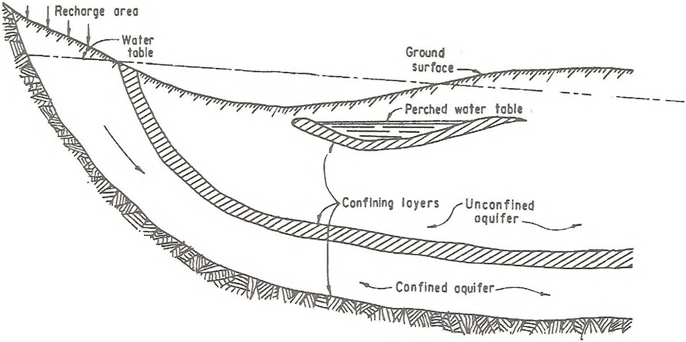


Figure 3-B-1. Groundwater system relationships (source: U.S. Bureau of Reclamation).

Cumulative Watershed Effects Analysis Procedure

The following is a description of a method for analyzing cumulative watershed effects currently used in the Klamath Falls Resource Area.

Cumulative watershed effects analyses are performed on a project level for individual timber sale environmental assessments. The analysis area for this level will generally be 3rd to 5th order watersheds (approximately 2,000 to 10,000 acres). Existing watershed conditions will be determined by developing a management history for all land within the watershed being analyzed, regardless of land ownership or administrative boundaries. Three types of hydrologic analyses are performed when evaluating cumulative watershed effects: determination of equivalent clearcut area, compacted area, and the extent of openings in the transient snow zone.

The calculated equivalent clearcut area value represents the total acreage within the delineated watershed considered to be in a clearcut condition in terms of hydrologic response. The equivalent clearcut area includes the area of clearcuts and roads plus an equivalent clearcut area for partial cuts, overstory removals, selective cuts, and commercial thinnings. Treatment factors are used to convert non-clearcut harvested acres to equivalent clearcut acres.

Forest harvest activities can result in soil compaction (in the form of roads, tractor skid trails, and cable corridors), affecting the hydrology of a watershed by significantly reducing infiltration and increasing surface runoff. The compacted area is calculated for BLM-administered land (based on road miles and acres harvested by each yarding system) and estimated for non-BLM land.

The transient snow zone is where shallow snowpacks accumulate and then melt throughout the winter in response to alternating cold and warm fronts. In the KFRA, this zone is generally found between 3,500 and 4,000 feet elevation. However, most of the planning area is located at elevations greater than 4,000 feet, so this phenomenon does not have a great influence on hydrology, except for some watersheds located in the southern portion of the planning area. Created openings, from a hydrologic point of view, are related to the stand structure and its influence

upon the accumulation and melt of snow in the transient snow zone. A created opening is considered fully recovered when there is 70 percent canopy closure and the average stem diameter of young trees is eight inches in diameter at breast height. The area in the with nonrecovered openings is calculated for each harvest type.

An evaluation of the existing watershed condition and channel stability and condition is then done to determine if past timber harvest activities have affected the magnitude of peak flows or sediment yields. Once a relationship between existing watershed condition and stream channel condition has been established, any proposed actions can be evaluated for their potential to cause degradation in stream channels, increase the magnitude and frequency of peak flows, and add to sediment yields.

The extent to which any or all of the following criteria exist would determine which watersheds would be identified to receive special management attention. These criteria are not listed in any priority order: highly erodible soils; high equivalent clearcut area; high compacted area; high non-recovered openings in the transient snow zone; high sedimentation potential; poor to fair channel stability or condition; poor to fair riparian condition; high effects from past catastrophic events; high road density; potential for negative effects on a beneficial use; monitoring data that shows water quality does not meet state water quality requirements. Further evaluation of the watershed may be needed, including gathering monitoring data to validate the conclusion of the effects analysis and to establish baseline data.

Watershed Condition Index Methodology

Introduction

The watershed condition index (WCI) is a method of rating the physiographic conditions (such as soil type) and land management activities (such as road building) that have some effect on the hydrological functions of watersheds. The index represents the *relative* condition of an entire analytical watershed and includes BLM-administered, private, and other agency lands; the WCI is best used to compare the effects of the different alternatives on one watershed, rather than to compare the effects from one alternative on different watersheds. It is a gross indicator of the cumulative effects of combined management activities within a watershed; differences in watershed condition due to individual project-level activities would be analyzed during project planning and in the associated environmental analysis. This appendix is an overview of the WCI methodology. More specific information on the methodology used, calculations, results, and the analysis records are available in the Klamath Falls Resource Area (KFRA) office.

Four subwatersheds of the Klamath-Spencer analytical watershed that are representative of conditions existing in the planning area were selected for west side analysis. The Barnes Valley Creek subwatershed was selected to represent east side conditions. The results of the WCI subwatershed analysis were used to *represent* the entire Klamath-Spencer analytical watershed and the entire east side.

The purpose of the WCI is to compare current conditions (as of October 1, 1988) in the selected analytical watersheds with future conditions anticipated under each of the seven land management alternatives in the RMP/EIS. To derive the WCI, the following assumptions were made: future BLM management activities described in the Ten-year Representative Timber Management Scenarios (RTMSs) for the alternatives would occur during the last five years of the planning period; half of all available merchantable timber on private lands would be cut during the life of the plan; U.S. Forest Service lands would be harvested at a level comparable to that on adjacent BLM-administered lands; and Oregon State Department of Forestry lands would be harvested at a level comparable to that on adjacent private lands.

The WCI is the product of selected rating elements that have the greatest effect on watershed condition. The rating elements are combined in mathematical formulas and adjusted using a constant (X) to rate the elements on a scale between 1 and 2. The constant was developed to reflect local conditions. A rating of 1 represents a minimal effect on watershed condition, 2 represents the maximum plausible effect, and ratings in the mid-range represent a moderate effect. Each rating element in the formula is assigned a multiplier which reflects the relative effect of each element on the watershed condition. For example, a paved road has less effects on watershed condition than a dirt road. The paved road is given a lower weighing, while the dirt road is given a higher weighing. These weighings are based on the professional knowledge and judgement of the KFRA hydrologist and other specialists.

The formula for calculating the watershed condition index is:

$$WCI = SDI \times VI \times SI \times RI \times MI \times KI \times AI \times DI \times PI \times FI \times LI$$

Where:

WCI = watershed condition index	SDI = soil disturbance index
VI = vegetation index	SI = silvicultural index
RI = riparian index	MI = mining index
KI = soils index	AI = slope/aspect index
DI = drainage density index	PI = precipitation index
FI = flow index	LI = landslide index

Individual Index Calculations

Methods for calculating the SDI, VI, and RI for the Ten-year Representative Timber Management Scenarios were derived from a method developed by the Medford District BLM. These methods were adapted to fit the information base available for the KFRA and to reflect local conditions.

Soil Disturbance Rating Method

Soil disturbance was rated by calculating the acres of roads by surface type, skid trails and landings, and other areas of soil disturbance. The data was collected through a photo inventory of the selected analytical watersheds, professional estimates where photo coverage was not adequate, and through Western Oregon Digital Database (WODDB) (Geographic Information System [GIS]) records. For the analysis of the alternatives, a recovery factor was assigned for the acreage in skid trails and landings. Roads and other disturbance areas were assumed to be non-recovering during the life of the plan. The formula for the soil disturbance index is:

$$SDI = 1 + ([P + 3R + 6D + 8S + 5O]/[W \times X])$$

Where:

P = paved roads (acres)	R = rocked/cindered roads (acres)
D = dirt roads (acres)	S = skid trails and landings (acres)

O = other disturbances, such as rock pits, waterholes, borrow ditches (acres)
W = watershed size (acres)
X = constant

Vegetation Type Rating Method

Each vegetation type was weighted based on its potential effect on watershed condition and water quality, as well as its relative effectiveness as ground cover. The acreage of each current vegetation type was estimated through a photo inventory of the selected analytical watersheds, Oregon Department of Forestry records (for harvest on private lands), BLM MICRO*STORMS database (records of harvest and other forest management activities), WODDB (GIS) records, and professional estimates. Forests that are younger than 20 years old were given one vegetation type rating, while forests that are older than 20 years old were considered to be recovered. Due to the lack of specific information on dates of harvest on private lands, no attempt was made to further subdivide the forests younger than 20 years old into separate categories. The acres assigned to the younger forests that are partial cut were equivalent acres. Equivalent acres were determined by assigning a harvest intensity factor to each harvest type, then multiplying the acres of each harvest type by the factor.

Effects of the RTMSs were analyzed by assigning a harvest intensity factor to each type of harvest. Harvests on private lands were assigned harvest intensity factors based on existing practices and assumptions of the amount of merchantable timber available to be harvested on those lands. A recovery factor was assigned to both BLM and non-BLM harvested lands to account for revegetation of harvested areas from planting, canopy recovery, and occupation of these areas by brush or herbaceous vegetation. The acres of forest that are younger than 20 years old were recalculated to reflect the acreage that is expected to exist at the end of the planning period on both BLM and non-BLM lands.

The formula used to calculate the vegetation index (VI) is:

VI = 1 + ([6M + 3P + 10D + 4F]/[W x X]) for west side analytical subwatersheds.

VI = 1 + ([6LS + 8J + 3M + 10D + 4F]/[W x X]) for the Barnes Valley Creek analytical subwatershed only.

Where:
VI= vegetation index
M = meadows/natural openings (acres)
P = pasture or permanent brush (acres)
D = disturbed/>20 percent bare soil areas (acres)
X = constant
LS= low sage (acres)
J = juniper woodland (acres)
W = watershed size (acres)
F = forests that are younger than 20 years old (acres)

Silvicultural Practices Rating Method

Five silvicultural practices that have the greatest effect on water quality and watershed condition were analyzed. Acreage of each practice were estimated through a photo inventory of the selected analytical watersheds, Oregon Department of Forestry records (for harvest on private lands), BLM MICRO*STORMS database (records of harvest and other forest management activities), WODDB (GIS) records, other KFRA records, and professional estimates. For analysis of the alternatives, acres were obtained from table 4-I-1 and table 2-1, and from estimates based on the acres to be harvested in each RTMS. Existing tractor-piled acres were assigned a recovery factor. Burn acres were analyzed using equivalent burn acres, based on the intensity (tons per acre consumed) of each type of prescribed burn in relation to a maximum potential prescribed burn (100 tons per acre was given a rating of 1). Other practices were analyzed in the alternatives as indicated below. The formula used to calculate the silvicultural index (SI) is:

SI = 1 + ([10T + 5B + 3H + 2F + P]/[W x X])

Where:
T = tractor piling (acres piled in the past 20 years and acres to be piled during the life of the plan)
B = burning (acres burned in the past two years and to be burned in the last two years of the plan)
H = herbicides (acres treated with herbicides in the past year and to be treated in the last year of the plan)
P = pre-commercial thinning (acres thinned in the past five years and to be thinned in the last five years of the plan).
W = watershed size (acres)
X = constant

Riparian Rating Method

Riparian conditions were classified through a photo inventory of the selected analytical watersheds, monitoring and inventory records, WODDB (GIS) records, and professional judgement. Because not all riparian zones in the planning area are forested, ratings were made based on channel and riparian condition, as they relate to the ability of the stream to function properly (see appendix 3-B, Riparian Zones section, for a discussion of proper functioning condition). The method to assess effects of the alternatives on the Riparian Index rating was developed by the Medford District BLM and is available in the KFRA office. The formula used to calculate the riparian index (RI) is:

RI = 1 ([10A + 7B + 4C + D]/[R x X])

Where:
A = acres rated minimal
R = total acres of riparian zones
B = acres rated fair
X = constant
C = acres rated good
D = acres rated optimal

Mining Rating Method

Mining was rated by the number of notices of operation for placer and sand/gravel/cinder mining, as well as the number of known existing sand/gravel/cinder pits. Only existing notices and operations were considered, as future plans on non-BLM lands were not known. The Ten-year Mining Scenario was analyzed separately from WCI calculations, as it is only a *possible* scenario. No accurate assessment could be made as to where many of the operations would occur nor to which analytical watershed the potential mining scenario should be assigned (see chapter 4, Effects on Water Resources section, for analysis of the effects of mining activities). The formula used to calculate the mining index (MI) is:

$$MI = 1 + ([N + S + G]/[T \times X])$$

Where:
N = number of notices of operation
S = number of existing sand/gravel/cinder operations
G = number of existing gold/silver placer mining operations
T = total stream miles
X = constant

Soils Rating Method

Soils were rated by using the K factor (soil erodibility factor) from the Universal Soil Loss Equation. The K factor was obtained from information provided by the Oregon State Office BLM, the SCS Soil Survey of Klamath County, and from *Use and Management of the Woodland Soils in the Gerber Reservoir Area, Lakeview BLM District* (Pomerening 1981). The formula used to calculate the soils index (KI) is:

$$KI = 1 + ([S1 \times K1 + S2 \times K2 + \ldots Sn \times Kn]/[W \times X])$$

Where:
S1, S2, Sn = acres of each soils series in the watershed
K1, K2, Kn = K number for each soil series
W = watershed size (acres)
X = constant

Slope-Aspect Rating Method

Acres of slopes over 60 percent were calculated by digitizing the U.S. Geological Survey topography map into GIS at a scale of 1:250,000 or, on the east side, using 7.5 minute USGS topographic maps. Unlike the other western Oregon districts, mass wasting is an insignificant erosional process in the planning area; thus, no critical aspect factor was included in this rating. The formula used to calculate the slope index is:

$$AI = 1 + ([S + C]/[W \times X])$$

Where:
S = area with greater than 60 percent slopes (acres)
C = area with critical aspect (acres) = 0
W = watershed size (acres)
X = constant

Drainage Density Rating Method

Drainage density was calculated using methods in the *National Handbook of Recommended Methods for Water Data Acquisition*. The formula used to calculate the drainage density index (DI) is:

$$DI = 1 + (T/[W \times K])$$

Where:
T = total stream miles in watershed
W = watershed size (acres)
X = constant

Precipitation Rating Method

Two-year, 24-hour precipitation amounts were used to calculate the precipitation index. These amounts were obtained from the National Oceanic and Atmospheric Administration (NOAA) *Precipitation Frequency Atlas of the Western United States*. The formula used to calculate the precipitation index (PI) is:

$$PI = 1 + (P \times X)$$

Where:
P = precipitation from the average 2-year, 24-hour storm in the watershed.
X = constant

Flow Rating Method

The yield from a 2-year flood, measured in cubic feet per second (cfs) per square mile, was used to calculate the flow index. The 2-year flood was obtained by using the USGS Water Resources Investigations Report *Magnitude and Frequency of Floods in Eastern Oregon*. The formula used to calculate the flow index (FI) is:

$$FI = 1 + (Q \times X)$$

Where:
Q = 2-year flood (cfs per square mile)
X = constant

Landslide Rating Method

Slope stability was determined by rating each soil series as stable or unstable. The stability index is calculated from the acres rated as unstable in the watershed. The formula used to calculate the landslide index (LI) is:

$$LI = 1 + (U/W)X$$

Where:
U = area of unstable soils (acres)
W = watershed size (acres)
X = constant

Current Watershed Condition

The current watershed condition for the selected analytical watersheds, as determined through the calculation of the WCI, are summarized below. The results of individual index calculations indicate potential stressors in the watersheds and opportunities for management. The index calculations and results are available in the KFRA office. Please refer to chapter 3, Water Resources section for discussion of water quality concerns for streams in the planning area.

Barnes Valley Creek

This analytical watershed had the lowest WCI (indicating better watershed condition) for current conditions of the four analytical subwatersheds. This may be due, in part, to application of this analysis method, which was developed for western Oregon, to an eastern Oregon ecosystem. Also, the percent of the watershed in managed forest is less than that for the other analytical watersheds. This watershed has the highest Soils Index rating (rating nearest 2, maximum plausible effect), due to the greater erodibility of its soils. This watershed also has the highest Riparian Index rating, due to conditions in Barnes Valley Creek (see chapter 3, Water Resources section) and the extreme variability in the flow regime of this stream.

Middle Spencer Creek

This analytical watershed had the highest Soils Disturbance Index rating, due to high road densities. Roads are contributing to higher than optimum sediment levels in Miner's Creek, a class 2 tributary to Spencer Creek. Miners Creek is located in this analytical subwatershed. This watershed also has the highest Flow Index rating.

Lower Buck Lake

This analytical watershed had the highest Mining Index rating and Precipitation Index rating. It also had a high Vegetation index rating due to the amount and type of harvest activity that has occurred. However, this watershed has a relatively low WCI, indicating better watershed condition.

South Hayden Creek

This analytical watershed had the highest Vegetation Index rating, Slope Index rating, and Landslide Index rating. Hayden Creek has had problems with erosion in the past, including bank sloughing and downcutting. Due to past livestock grazing practices, woody riparian vegetation is lacking. Woody riparian vegetation provides shading from solar radiation for areas of the stream that are not shaded by conifers. Summertime water temperatures in this stream are higher than optimal, due in part to this lack of shading. There has been considerable recent activity on non-BLM lands in this watershed, which accounts for this watershed having the highest WCI value. Also, the lower part of this watershed is located on the steep (>60 percent) slopes draining into the Klamath River. Hayden Creek has been identified for riparian restoration and enhancement projects, such as revetment (rip rap) using juniper and planting of woody riparian species. A portion of the stream has been fenced to exclude livestock use.

Appendix 3-C. Wildlife

Introduction

This appendix is a listing of suspected and documented wildlife species found in the Klamath Falls Resource Area and the type of habitats where they are generally found. However, since the resource area lies within two distinct physiographic provinces (see the Topography and Geology section of chapter 3) this listing has been separated into two sections. The first section lists the species found on the west side of the resource area, while the second section lists the species found on the east side. Some of the species can be found on both the east and west sides and are listed in both sections.

West Side

List of wildlife species and primary habitat[1] affinities in the Klamath Falls Resource Area.

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Northwestern Salamander	X			X	X	X			X
Long-toed Salamander	X	X	X						X
Pacific Giant Salamander			X	X	X	X			X
Olympic Salamander				X	X	X	X		
Roughskin Newt	X	X	X	X	X	X			
Ensatina	X	X							X
Clouded Salamander	X								X
Tailed Frog			X	X	X	X			X
Western Toad	X	X				X			X
Pacific Treefrog	X	X	X	X	X	X			X

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Spotted Frog	X								
Bullfrog						X			
Foothill Yellow-legged Frog						X			
Western Pond Turtle	X	X				X			X
Western Fence Lizard	X	X					X		X
Western Skink	X					X	X		X
Northern Alligator Lizard	X	X							X
Rubber Boa	X	X							X
Sharptail Snake						X	X		X
California Mountain Kingsnake	X	X				X			X
Ringneck Snake	X	X				X			X
Gopher Snake						X			
Common Garter Snake						X			X
Western Terrestrial Garter Snake						X			X
Western Aquatic Garter Snake						X			
Northwestern Garter Snake	X								

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Western Rattlesnake							X		X
Opossum						X		X	X
Masked Shrew	X							X	
Trowbridge's Shrew			X	X	X	X			X
Vagrant Shrew	X					X			X
Dusky Shrew			X	X	X	X		X	
Pacific Water Shrew						X			X
Water Shrew						X			X
Shrew-mole			X	X		X			X
Broad-footed Mole	X					X			
Little Brown Myotis			X	X	X	X	X	X	
Yuma Myotis				X	X		X	X	
Keen Myotis	X			X	X	X	X	X	
Long-eared Myotis				X	X	X		X	
Fringed Myotis	X					X	X		
Long-legged Myotis	X	X		X	X	X	X	X	
California Myotis	X	X	X	X	X	X	X	X	
Silver-haired Bat	X	X	X	X	X	X		X	
Big Brown Bat	X				X	X	X	X	

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Hoary Bat	X	X		X		X			
Pallid Bat						X	X		
Townsend's Big-eared Bat	X	X					X	X	
Brazilian Free-tailed Bat			X						
Black Bear	X	X	X	X	X	X			X
Raccoon	X	X	X	X	X	X		X	
Ringtail						X	X		
Marten			X	X	X	X		X	X
Fisher			X	X	X		X	X	X
Long-tailed Weasel	X							X	X
Short-tailed Weasel	X		X	X	X	X	X		X
Mink						X			X
River Otter						X			
Spotted Skunk	X	X				X	X	X	X
Striped Skunk						X			
Coyote	X	X				X	X		X
Red Fox	X								X
Mountain Lion	X	X		X			X		
Bobcat	X	X				X	X		X

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
California Ground Squirrel	X								
Townsend's Chipmunk	X		X	X	X		X		X
Yellow Pine Chipmunk				X	X		X	X	
Northern Flying Squirrel				X	X				
Douglas' Squirrel	X		X	X	X			X	
Western Gray Squirrel								X	
Botta's Pocket Gopher	X					X			
Beaver						X			
Deer Mouse	X	X					X	X	
Dusky-footed Woodrat	X	X	X	X	X				
Bushy-tailed Woodrat			X	X	X	X	X		X
Western Red-backed Vole			X	X	X				X
Townsend Vole	X					X			
Longtail Vole	X					X	X		X
Oregon Vole	X	X							
Creeping Vole						X			X

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Western Jumping Mouse						X			
Pacific Jumping Mouse	X								
Porcupine	X	X	X	X	X	X	X		X
Snowshoe Hare	X								
Brush Rabbit	X	X		X		X			
Roosevelt Elk	X	X	X	X	X	X			
Black-tailed Deer	X	X	X	X		X			
Black-crowned Night Heron						X			
Great Egret						X			
Great Blue Heron				X		X			
Sandhill Crane									
Canada Goose						X			
Mallard						X			
Gadwall						X			
Green-winged Teal						X			
American Wigeon						X			
Northern Pintail						X			
Northern Shoveler						X			

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Blue-winged Teal						X			
Wood Duck				X	X	X		X	
Barrow's Goldeneye				X	X	X		X	
Bufflehead				X	X	X		X	
Common Merganser				X	X	X		X	
Hooded Merganser				X	X	X		X	
Virginia Rail						X			
Sora						X			
American Coot						X			
Common Snipe						X			
Turkey Vulture	X				X	X	X		X
Golden Eagle	X				X				
Bald Eagle					X	X		X	
Northern Harrier						X			
Sharp-shinned Hawk			X	X	X	X			
Cooper's Hawk			X	X	X	X			
Northern Goshawk				X	X				
Red-tailed Hawk	X				X	X	X		
Rough-legged Hawk						X			
Osprey						X		X	

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
American Kestrel						X		X	
Peregrine Falcon							X		
Prairie Falcon							X		
Ruffed Grouse						X			X
Mountain Quail	X								
Blue Grouse	X	X	X	X	X				
Wild Turkey	X	X	X	X	X				
Ring-necked Pheasant						X			
Band-tailed Pigeon						X			
Rock Dove							X		
Mourning Dove						X			
Common Barn-owl	X					X		X	
Long-eared Owl	X					X			
Great Horned Owl				X	X	X			
Barred Owl				X	X	X		X	X
Northern Pygmy Owl				X	X				
Northern Spotted Owl					X				
Northern Saw-whet Owl	X			X	X	X		X	

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Western Screech-owl						X		X	
Common Nighthawk	X							X	
Vaux's Swift	X	X			X	X		X	
Anna's Hummingbird						X			
Rufous Hummingbird	X	X		X		X			
Belted Kingfisher						X			
Northern Flicker	X			X	X	X		X	X
Red-breasted Sapsucker						X			
Downy Woodpecker						X		X	
Acorn Woodpecker	X							X	
Lewis Woodpecker	X				X			X	X
Hairy Woodpecker				X	X			X	X
Pileated Woodpecker					X			X	X
Olive-sided Flycatcher				X	X				
Western Wood-pewee	X	X		X	X	X			
Hammond's Flycatcher				X	X	X			
Willow Flycatcher						X			

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Western Flycatcher					X	X			
Tree Swallow	X				X	X		X	
Violet-green Swallow						X	X	X	
Purple Martin						X		X	
Bank Swallow						X	X		
Northern Rough-winged Swallow						X	X		
Cliff Swallow						X	X		
Barn Swallow						X			
Steller's Jay	X	X	X	X	X	X			
Gray Jay		X	X	X	X	X			
Common Raven	X	X		X	X	X	X		
Black-capped Chickadee				X	X	X		X	
Brown Creeper				X	X	X		X	
White-breasted Nuthatch						X		X	
Red-breasted Nuthatch				X	X	X		X	X
House Wren						X		X	X
Winter Wren				X	X	X			X
Bewick's Wren						X			X

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Golden-crowned Kinglet			X	X	X	X			
Ruby-crowned Kinglet	X	X		X	X	X			
Western Bluebird						X			
Townsend's Solitaire	X	X		X	X		X		X
Varied Thrush				X	X	X			
Swainson's Thrush	X	X	X	X	X	X			
Hermit Thrush	X			X	X				
American Robin	X	X				X			
Northern Shrike						X			
Water Pipit						X			
Cedar Waxwing						X			
European Starling						X		X	
Hutton's Vireo						X			
Solitary Vireo				X	X				
Warbling Vireo						X			
Orange-crowned Warbler	X					X			
Yellow-rumped Warbler	X		X	X	X	X			
Townsend's Warbler				X	X	X			

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Black-throated Gray Warbler	X	X		X	X	X			
Hermit Warbler			X	X	X	X			
Yellow Warbler						X			
MacGillivray's Warbler						X			
Wilson's Warbler						X			
Common Yellowthroat						X			
Yellow-breasted Chat						X			
Black-headed Grosbeak						X			
Lazuli Bunting						X			
Rufous-sided Towhee	X	X				X			X
Savannah Sparrow						X			
Chipping Sparrow	X	X				X			
Dark-eyed Junco	X	X			X	X			
White-crowned Sparrow	X					X			
Golden-crowned Sparrow						X			
Fox Sparrow						X			
Lincoln's Sparrow						X			

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Red-winged Blackbird						X			
Brewer's Blackbird	X					X			
Brown-headed Cowbird	X	X				X			
Northern Oriole						X			
Western Tanager	X			X	X	X			
Pine Siskin	X	X	X	X	X	X			
Red Crossbill				X	X	X			
American Goldfinch						X			
Lesser Goldfinch						X			
Purple Finch	X	X			X	X			
Evening Grosbeak	X	X	X	X		X			

East Side

Long-toed Salamander	X		X			X			X
Western Toad	X	X	X		X	X			X
Great Basin Spadefoot Toad	X	X	X		X	X			
Pacific Tree Frog	X	X	X		X	X	X		X
Bullfrog						X			

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Spotted Frog	X	X	X		X	X			
Western Fence Lizard	X	X	X		X	X	X		X
Side-blotched Lizard	X					X	X		
Short-horned Lizard	X	X	X		X	X			
Northern Alligator Lizard						X			
Western Skink	X	X	X			X	X		X
Rubber Boa	X	X	X		X	X			X
Ringneck Snake	X	X	X		X	X			X
Yellow-bellied Racer	X	X	X		X	X	X		
Gopher Snake	X	X	X		X	X	X		X
Common Garter Snake	X	X	X		X	X			X
Western Terrestrial Garter Snake	X	X	X		X	X	X		X
Western Rattlesnake	X	X	X		X	X	X		X
Merriam Shrew	X								X
Vagrant Shrew	X	X	X		X	X	X		X
Northern Water Shrew	X	X	X		X	X			X
Little Brown Myotis	X		X		X	X	X	X	
Yuma Myotis			X		X	X		X	

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Long-eared Myotis	X	X	X		X	X		X	
Long-legged Myotis	X	X	X		X	X		X	
California Myotis	X		X		X	X	X	X	
Small-footed Myotis	X						X		
Silver-haired Bat	X	X	X		X	X		X	
Western Pipistrel	X						X		
Big Brown Bat	X	X	X		X	X	X	X	
Hoary Bat	X	X	X		X	X			
Spotted Bat	X						X		
Townsend's Big-eared Bat	X	X	X		X	X			
Pallid Bat	X				X	X	X	X	
Pika	X								
Mountain Cottontail	X	X	X		X	X			X
Pygmy Rabbit	X								
Snowshoe Hare	X	X	X						X
White-tailed Jackrabbit	X								
Black-tailed Jackrabbit	X								
Least Chipmunk	X						X		

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Yellow Pine Chipmunk	X	X	X		X	X	X	X	X
Yellow-bellied Marmot	X						X		X
Belding Ground Squirrel	X								
Golden-mantled Ground Squirrel	X	X	X		X	X	X	X	X
Western Gray Squirrel		X	X		X	X		X	X
Douglas Squirrel (Chickaree)		X	X		X	X		X	X
Northern Flying Squirrel		X	X		X	X		X	X
Northern Pocket Gopher	X	X	X		X	X			
Beaver	X	X	X			X			X
Western Harvest Mouse	X	X	X		X	X			X
Canyon Mouse	X						X		
Deer Mouse	X	X	X		X	X	X	X	X
Pinyon Mouse	X						X		X
Bushy-tailed Woodrat	X	X	X		X	X	X		X
Sagebrush Vole	X						X		
Mountain Vole	X		X		X	X	X		X

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Long-tailed Vole	X	X	X		X	X			X
Muskrat	X	X	X		X	X			X
House Mouse	X	X				X			
Norway Rat	X	X				X			
Western Jumping Mouse	X		X		X	X			X
Porcupine	X	X	X			X	X		X
Nutria	X	X	X			X			
Coyote	X	X	X		X	X	X		X
Gray Fox	X	X	X		X	X			X
Black Bear	X	X	X		X	X	X		X
Ringtail		X	X			X			
Raccoon	X		X		X	X		X	X
Marten		X	X		X	X	X	X	X
Fisher		X	X		X	X	X	X	X
Mink	X	X	X		X	X			X
Long-tailed Weasel	X	X	X		X	X	X	X	X
Short-tailed Weasel	X	X	X		X	X	X	X	X
Badger	X	X	X		X	X	X		
Spotted Skunk	X	X				X	X	X	X
Striped Skunk	X					X	X		X

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
River Otter	X	X	X		X	X			X
Mountain Lion	X	X	X		X	X			X
Bobcat	X	X	X		X	X	X		X
Elk	X	X	X		X	X			X
Mule Deer	X	X	X		X	X			X
Pronghorn	X	X	X		X	X			
Western Grebe	X					X			
Eared Grebe	X					X			
Pied-billed Grebe	X					X			
American White Pelican	X					X			X
Double-crested Cormorant	X					X			X
American Bittern	X					X			
Black-crowned Night Heron	X	X	X			X			X
Great Egret	X					X			
Great Blue Heron	X		X			X			X
White-faced Ibis	X					X			X
Sandhill Crane	X					X			
Tundra Swan	X					X			X

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Greater White-fronted Goose	X					X			X
Snow Goose	X					X			X
Ross' Goose	X					X			X
Canada Goose	X	X	X			X	X		X
Mallard	X	X	X			X			X
Gadwall	X	X	X			X			X
Green-winged Teal	X	X	X			X			X
American Wigeon	X	X	X			X			X
Northern Pintail	X					X			
Northern Shoveler	X					X			X
Blue-winged Teal	X					X			X
Cinnamon Teal	X					X			X
Ruddy Duck	X					X			X
Wood duck	X	X	X		X	X		X	X
Canvasback	X					X			
Redhead	X					X			
Ring-necked Duck	X	X	X			X			X
Lesser Scaup	X					X			X
Barrow's Goldeneye	X	X	X		X	X		X	X

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Bufflehead	X	X	X		X	X		X	
Common Merganser	X	X	X		X	X		X	X
Hooded Merganser	X	X	X		X	X		X	X
Virginia Rail	X	X	X			X			
Sora	X	X	X			X			
American Coot	X	X	X			X			
American Avocet	X					X			
Black-necked Stilt	X					X			
Snowy Plover	X					X			
Killdeer	X					X			
Willet	X					X			
Greater Yellowlegs	X					X			
Spotted Sandpiper	X					X			
Wilson's Phalarope	X					X			X
Common Snipe	X					X			
Ring-billed Gull	X					X			X
Herring Gull	X					X			X
California Gull	X					X			X
Forster's Tern	X					X			
Black Tern	X					X			

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Caspian Tern	X					X			
Turkey Vulture	X				X	X	X		X
Golden Eagle	X	X	X		X	X	X	X	
Bald Eagle	X		X		X	X		X	
Northern Harrier	X					X			X
Sharp-shinned Hawk	X	X	X		X	X		X	X
Cooper's Hawk	X	X	X		X	X		X	X
Northern Goshawk	X	X	X		X	X	X	X	X
Red-tailed Hawk	X	X	X		X	X	X	X	
Rough-legged Hawk						X			X
Osprey	X	X	X		X	X		X	
American Kestrel	X	X	X		X	X	X	X	
Merlin	X	X	X		X	X			
Prairie Falcon	X					X	X		
Peregrine Falcon	X	X	X		X	X	X		
Sage Grouse	X								
Blue Grouse	X	X	X		X				X
California Quail	X	X				X			X
Mountain Quail	X	X	X		X	X			X
Chukar	X						X		X

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Red-legged Partridge	X								
Ring-necked Pheasant	X	X	X						X
Wild Turkey	X	X	X		X	X	X		X
Rock Dove	X					X	X		
Mourning Dove	X	X	X			X			
Common Barn Owl	X		X		X	X	X	X	
Short-eared Owl	X					X			
Long-eared Owl	X	X	X		X	X		X	
Great-horned Owl	X	X	X		X	X	X	X	
Western Screech Owl	X	X	X		X	X	X	X	
Great Gray Owl	X		X		X			X	
Northern Pygmy Owl	X	X	X		X	X	X	X	
Northern Saw-whet Owl		X	X		X	X		X	
Vaux's Swift			X		X	X	X	X	
Common Nighthawk					X		X		X
Black-chinned Hummingbird	X	X	X		X	X			
Calliope Hummingbird	X	X	X		X	X			

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Broad-tailed Hummingbird	X	X				X			
Rufous Hummingbird	X	X	X		X	X			
Belted Kingfisher	X	X	X		X	X			
Northern Flicker	X	X	X		X	X		X	X
White-headed Woodpecker			X		X				
Lewis' Woodpecker	X	X	X		X	X		X	X
Williamson's Sapsucker			X		X			X	
Downy Woodpecker		X	X		X	X		X	X
Hairy Woodpecker		X	X		X			X	X
Three-toed Woodpecker			X		X			X	X
Pileated Woodpecker			X		X			X	X
Western Kingbird	X	X	X			X		X	X
Ash-throated Flycatcher			X		X	X		X	X
Olive-sided Flycatcher	X	X	X		X	X		X	X
Western Wood-pewee	X	X	X		X	X			X
Say's Phoebe	X	X	X		X	X	X		X
Gray Flycatcher					X	X	X		

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Dusky Flycatcher	X	X	X		X	X		X	X
Willow Flycatcher	X	X				X			X
Western Flycatcher	X	X	X		X	X		X	X
Horned Lark	X								
Tree Swallow	X	X	X		X	X		X	
Violet-green Swallow	X	X	X		X	X		X	
Purple Martin		X	X		X	X			
Cliff Swallow	X	X	X		X	X	X		
Northern Rough-winged Swallow	X				X	X			
Barn Swallow	X					X	X		
Scrub Jay	X	X	X			X			
Stellar's Jay	X	X	X		X	X	X		X
Black-billed Magpie	X	X	X		X	X	X		X
Common Raven	X				X	X	X		
Black-capped Chickadee		X	X		X	X		X	X
Mountain Chickadee	X	X			X			X	X
Bushtit	X	X	X		X	X			X
Brown Creeper			X		X	X		X	X

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
White-breasted Nuthatch			X		X			X	X
Red-breasted Nuthatch			X		X			X	X
Pygmy Nuthatch			X		X			X	
House Wren	X	X	X		X	X		X	X
Bewick's Wren	X	X	X			X			
Marsh Wren	X					X			
Canyon Wren	X						X		X
Rock Wren	X						X		X
Ruby-crowned Kinglet		X	X		X				
Swainson's Thrush	X	X	X		X	X			X
Hermit Thrush		X	X		X	X			X
American Robin	X	X	X		X	X			
Western Bluebird									X
Mountain Bluebird									X
Loggerhead Shrike	X	X	X		X	X	X		X
Northern Shrike						X			X
Sage Thrasher	X	X	X		X	X			
Water Pipit	X					X			

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
American Dipper	X	X	X		X	X			X
Cedar Waxwing	X	X	X			X			
European Starling	X	X	X		X	X	X	X	X
Solitary Vireo		X	X		X	X			
Warbling Vireo	X	X	X		X	X			
Orange-crowned Warbler	X	X				X			
Nashville Warbler	X	X				X			X
Yellow-rumped Warbler		X	X		X	X			
Townsend's Warbler			X		X	X			
Yellow Warbler	X	X	X			X			
MacGillivray's Warbler		X	X			X			
Wilson's Warbler	X	X	X			X			X
Common Yellowthroat	X					X			
Yellow-breasted Chat	X	X	X		X	X			X
Black-headed Grosbeak	X	X	X		X	X			
Lazuli Bunting	X	X	X		X	X			
Green-tailed Towhee	X	X	X		X	X	X		X
Rufous-sided Towhee	X	X	X		X	X	X		X

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Vesper Sparrow	X					X			
Savannah Sparrow	X					X			
Black-chinned Sparrow	X	X	X			X			
Song Sparrow	X	X	X			X			X
Chipping Sparrow	X	X	X		X	X			X
White-crowned Sparrow	X	X	X		X	X			X
Golden-crowned Sparrow					X			X	
Fox Sparrow	X	X	X		X	X			X
Dark-eyed Junco	X	X	X		X	X			X
Lincoln's Sparrow	X	X	X			X			X
Lark Sparrow	X								
Bobolink	X					X			
Western Meadowlark	X								
Yellow-headed Blackbird		X					X		
Brewer's Blackbird	X	X	X		X	X			
Red-winged Blackbird	X					X			X
Brown-headed Cowbird	X	X	X		X	X			
Northern Oriole	X	X	X			X			

Species	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Down
Western Tanager	X	X	X		X	X			
House Sparrow	X	X	X		X	X		X	
Pine Siskin	X	X	X		X	X	X		X
American Goldfinch	X	X	X			X			X
Lesser Goldfinch	X						X		X
Red Crossbill			X		X	X			
Purple Finch	X	X	X		X	X			
Cassin's Finch	X	X	X		X	X			
House Finch	X	X	X		X	X			
Evening Grosbeak	X	X	X		X	X			

[1] Primary habitat is breeding, feeding, or resting habitat within the respective seral stages and unique habitats (after Brown 1985).

Appendix 3-D Fish

Introduction

This appendix consists of two sections: Fish Species in the Klamath Falls Resource Area and Stream Habitat Quality Rating. The first section lists the major fish species found in the streams and lakes of the Klamath Falls Resource Area. The second section describes the proccess used in rating the quality of stream habitat.

Fish Species in the Klamath Falls Resource Area

Salmonid

Rainbow trout
Cutthroat trout
Brown trout
Brook trout
Redband trout

Nonsalmonid

Pacific lamprey
Chub *Gila spp.*
Dace *Rhinichthys spp.*
Shiners *Richardsonius spp.*
Bullheads *Ictalurus spp.*
Catfish
Stickleback
Yellow perch
Sunfishes *Lepomis spp.*
Fathead minnow
Sculpins *Cottus spp.*
Lost River sucker
Shortnose sucker
Klamath largescale sucker
Klamath smallscale sucker

Stream Habitat Quality Rating

The rationale for using riparian tree size (diameter at breast height [dbh]) to rate stream habitat quality is based on research (Sedell et al. 1988), inventory data, and the field experience of BLM fishery biologists. Data from these sources indicates that vegetative conditions (size of trees) in adjacent riparian zones are directly related to stream habitat quality and fish populations. Trees in riparian zones fall into streams and create desirable habitat conditions. Tree size information is available in the BLM Operations Inventory and was used for making the initial stream habitat quality rating.

A "related factors" analysis was done to determine if other factors should be considered in making a final habitat quality rating. There are many interrelated physical and biological factors that affect the quality of fish habitat and fish populations. In addition to tree size in riparian zones, other factors include amount of water diversion, amount of sediment yield, availability of natural structure, presence of beaver dams or side channels, and/or presence of rehabilitation structures. Some of these factors are not inventoried for all BLM stream segments; therefore, the district biologist determined which of the known factors were most important in making a final habitat rating.

In the KFRA other factors were considered. In many areas the riparian zones did not contain trees through natural conditions. Some riparian zones contain deciduous trees whose diameters seldom reach 21 inches. In these areas the stream condition was based on Oregon Department of Fish and Wildlife and BLM biologist's opinions.

On the east side no riparian analysis was completed. Therefore, all stream conditions were based on biologist's opinion.

Using the initial rating based on tree size and the related factors analysis, conditions of all streams were rated as minimal, fair, or good/optimal (see table 3-14).

The characteristics of the condition classes are as follows:

Minimal. Major alterations in watershed, water quality and quantity conditions, natural stream habitat and riparian zones; few or no large trees present in riparian zones, with most trees between 0 and 11 inches dbh; little or no large woody debris; pools few and shallow; heavy sedimentation of streambed by sand and silt; stream productivity for aquatic life drastically reduced, fish populations between 10 and 25 percent of potential.

Fair. Watershed moderately impacted by activities; riparian vegetation altered by past events or activities, few large trees present, with most trees between 11 and 21 inches dbh; physical stream conditions substantially altered from natural conditions because of past or present activities, such as limited amounts of large woody debris and fine sediments in pools and riffles; some adverse changes in water quality and quantity; habitat either partly recovered or still decreasing in trend; stream moderately productive for aquatic life, but fish populations far below potential (approximately 50 percent).

Good/Optimal. Watershed either not greatly impacted by activities or mostly recovered; riparian zones have diverse vegetation, including large trees over 21 inches dbh; physical stream conditions only slightly altered, with nearly complete recovery or virtually unchanged from natural conditions (abundant and diverse instream structure including large woody debris, numerous deep pools, bottom substrate relatively free from fine sediments, adequate spawning gravels, and stable banks and channels); water quality and quantity (such as temperature, turbidity, and flow) generally unaltered from natural conditions; stream highly productive for aquatic life, producing at or near its potential for salmon, trout, and other native fishes.

Introduction

This appendix contains two parts: Identification and Screening of Candidate ACECs and Present Condition of Potential Special Areas. The first section describes the results of the screening process for ACECs. The second section describes the current condition of various potential special areas.

Identification and Screening of Candidate ACECs

During the initial stages of the planning process, the public, BLM employees, and other government agencies identified 12 sites within the planning area with resource values that could meet criteria for areas of critical environmental concern (ACEC). These identified areas became candidate areas. To be a potential ACEC, a candidate area must meet both "importance" and "relevance" criteria. Each candidate area was screened by an interdisciplinary team (IDT) to determine whether these criteria were met, and if met, the IDT proposed boundaries and management objectives for the potential ACEC. The IDT recommendations were then submitted to the Area Manager for a decision and then to the District Manager for concurrence. The results of this process are summarized in the table below.

Candidate ACEC Screening Results

Candidate ACEC	Nomination Source	Nomination Acres	Relevance	Importance	ACEC Acres	Comments
Miller Creek	Audubon Society	0[1]	Y-W,N,S	Y-L,F	2,000	Miller Creek from Gerber Dam to the Goodlow Rim. Area will be further evaluated as a potential ACEC.
Pacific Crest Trail/Old Baldy Area	Sierra Club	0[1]	Y-N,S	Y-L,F	620	Only those BLM-administered lands located in Klamath County, including area immediately surrounding Old Baldy. The KFRA will follow Medford District's previous decision to further evaluate the area as a potential ACEC. Old Baldy potential Resource Natural Area (RNA) included in the original screening process.
Upper Klamath River	Sierra Club	5,700	Y-H,C,S, F,W,N,Z	Y-L,F,P	4,960	Klamath River from rim to rim extending from John C. Boyle Powerhouse to the Oregon/California state line. Area will be further evaluated as a potential ACEC.
Yainax Butte	BLM	480	Y-N	Y-L,F,P	720	BLM-administered lands on top of Yainax Butte. Area will be further evaluated as a potential ACEC.

Candidate ACEC	Nomination Source	Nomination Acres	Relevance	Importance	ACEC Acres	Comments
Alkali Lake	BLM	240	No	No	240	Wetland area located in Yonna Valley. Area will not further be evaluated as an ACEC. Area will be further evaluated for special management.
Spencer Creek	BLM	320	Y-F,S	Y-F	320	Area will be further evaluated as a potential ACEC.
Tunnel Creek	Nature Conservancy	280	Y-N	Y-F,P	280	Natural wetland communities present are threatened state-wide. Area will be further evaluated as a potential ACEC.
The Bumpheads	BLM	50	Y-S,N	Y-F,P	50	Several rim-rock-bordered tabletops in Gerber Block. Area will be further evaluated as a potential ACEC.
Clover Creek	BLM	30	No	No	30	Area will not be further evaluated as an ACEC. Area will be further evaluated for special management.
Surveyor Forest Area	BLM	150	Y-N,S,W	Y-F,P	150	Unlogged, old growth area adjacent to Surveyor Recreation Site. Area will be further evaluated as a potential ACEC.
Barnes Valley Creek	BLM	480	Y-S	No	480	From Gerber Reservoir east to Moonshine Spring. Area will not be further evaluated as an ACEC.
Lower Goodlow Mountain	BLM	1,760	No	No	1,760	Area adjacent to Goodlow Mountain RNA on the Freemont National Forest. Area will not be further evaluated as an ACEC.

[1] Physical description given in nomination, acreage figures not included.

Abbreviations used in this table:

Relevance

C - Cultural Value
F - Fish Value
H - Historic Value
N - Natural Process or System
S - Scenic Value
W - Wildlife Value
Z - Hatural Hazard

Importance

F - Fragile, Sensitive, Unique, Threatened, etc.
H - Warrants Protection
L - More than Locally Significant
P - Warrants Protection
T - Poses a Threat
Y - Yes, meets the criteria for the listed ______
No - Does not meet any of criteria

Present Condition of Potential Special Areas

Special Area	Present Condition
Miller Creek Potential ACEC	Very scenic, natural ecosystem that is a unique feature of Gerber Plateau. Vegetative communities differ from those that dominate the surrounding plateau due to increased soil moisture and decreased air temperature. Some localized timber harvesting near stream crossing in section 13. Riparian zone in relatively good condition, steep canyon walls have naturally restricted livestock grazing and timber harvesting.
Pacific Crest Trail Potential ACEC	Limited timber harvest along this section of PCT. Predominately young Shasta red fir with very little understory vegetation, and associated high elevation brushfields. Good scenic viewing opportunities along this section of the trail. Area closed to off-road vehicle use.
Upper Klamath River Potential ACEC	Designated state scenic waterway by Oregon voters. Wide diversity of plant communities and wildlife. Evidence of intense livestock grazing. No timber sale activity during the last decade. Few significant scenic quality detractors to casual observer. Great variety of cultural resources needing interpretation and protection. City of Klamath Falls has an application pending for proposed Salt Caves Hydroelectric Project.
Yainax Butte Potential ACEC	Area receives limited use by recreationists, mostly hunters in fall. Site is relatively isolated and steep which naturally protects it from surrounding land uses such as livestock grazing and timber harvesting. It contains natural diversity due to elevational differences. Significant populations of T&E plant species.
Alkali Lake	Wetlands characterized by shallow lake and associated vegetation. Area surrounding lake grazed. Migratory waterfowl present.
Spencer Creek Potential ACEC	The riparian zone is characteristic of high gradient stream reaches with little depositional material, and consequently no wet meadow development. The creek flows through mixed conifer forest that has had several timber harvests, with riparian buffers kept intact. The area has high scenic quality, clear, cascading waterfalls, significant trout fisheries, and spawning habitat.
Tunnel Creek Wetlands Potential ACEC	Wetlands characterized as a lodgepole pine/western bog huckleberry swamp. Part of site, owned by Weyerhaeuser Company, has been clearcut. The site still offers considerable benefits for a diversity of wildlife species as well as the natural wetland communities present.
The Bumpheads Potential ACEC	The Bumpheads are rim-rocked volcanic tabletops located in the Gerber Block. They are in good condition with healthy bunchgrasses and western juniper prominent in the natural plant community, and have been naturally isolated from grazing. Good scenic viewpoint of surrounding terrain.
Clover Creek Forest Educational Area	The site is near Clover Creek, which often is dry or at least goes underground Educational Area on a variable basis. The riparian zone is dominated by aspens and willows with a sedge understory. The forest education site has received limited grazing and selective timber harvesting. Area presently used by local elementary schools for annual forestry tour.

Special Area	Present Condition
Surveyor Forest Potential ACEC	This area, adjacent to Surveyor recreation site, is characterized by an unlogged, old growth forest community. Species mix includes white fir and other mixed conifers with dominant, large Douglas fir. The area is grazed. The boundaries of the area include those stands that have not been timber harvested.
Old Baldy Proposed Research Natural Area	Predominately young Shasta red fir/white fir and associated high elevation brushfields. Several recent timber sale areas and one proposed timber sale area are located within the proposed boundary. Core areas of proposed RNA are generally protected from previous timber thinning areas.

Appendix 3-F
Cultural Resources

Introduction

This appendix describes the basic procedures and inventory classes used in cultural resource management. The BLM's standard cultural resource program consists of the three classes of inventory described below.

Cultural Resource Inventory Procedures

Class I inventories consist of reviewing existing data and compilation of this data into a Cultural Resource Overview document.

Class II inventories are field sampling strategies. They are designed to gather statistically valid data to provide objective estimates of the nature and distribution of cultural resources in a defined study area. Sample areas selected for survey in a Class II inventory are surveyed at the same intensity as for a Class III inventory.

Class III inventories are intensive field survey strategies designed to identify (from surface and exposed subsurface indications) and record all cultural resource sites within a specific location. Class III inventories are completed prior to beginning projects that may cause disturbance or destruction of sites. Activities related to timber sales, road construction, and range improvements are typical of the kinds of projects which require Class III inventories.

When possible, sections of project areas will be resurveyed after completion of the project. These post project surveys will estimate the accuracy of the original survey.

Class I inventories of Klamath Falls Resource Area (KFRA) lands were conducted in 1978 and 1979 before the formation of the resource area. A Class I inventory from the previous Jackson-Klamath Planning Unit of the Medford District covers the west side of the KFRA and a Class I inventory from the Lakeview District covers the east side.

A Class II inventory of 750 acres (12.5 percent) of BLM-administered land in the upper Klamath River Canyon was conducted in 1989.

Class III inventories have been conducted on approximately 13,300 acres (6 percent) of the 212,000 acres of BLM-administered land in the KFRA.

The eligibility of some cultural resource sites for inclusion on the National Register of Historic Places has been assessed using criteria described in 36 CFR 60.0. None of these sites have been nominated yet, although parts of the Gerber Reservoir area and the upper Klamath River Canyon may be eligible as National Register Historic Districts.

Chapter 4
Appendix

Appendix 4-A
Timber Analysis

Introduction

This appendix consists of four parts. The first describes the timber supply situation in Klamath County and Western Oregon, and the BLM's share of past and future supplies. The second part is a sensitivity analysis that examines how selected land-use allocations and management approaches can affect allowable sale quantities (ASQ), county revenue, fish populations, northern spotted owl habitat, and biological diversity. The third part contains tables showing the ASQ by alternative for the Klamath sustained yield unit and both the west and east sides of the Klamath Falls Resource Area (KFRA). The fourth section contains a discussion of the timber supply and its analysis for the BLM planning

Timber Supply

During the 1984-88 baseline period, timber harvests on BLM-administered lands in the KFRA constituted 3.5 percent of the total timber harvest in Klamath county. Compared to the *total* harvest of the baseline period, the alternatives would range from 3.7 percent (No Action) to 0.9 percent (Preferred) of the total future harvest in Klamath county. Due to the small proportion of timber supplied by BLM-administered lands, the variation in timber supply from BLM-administered lands resulting from selection of any alternative would be overshadowed by normal variations in the supply caused by other market and resource factors.

Compared to the 1984-88 baseline, BLM harvests would range from an increase in alternative A (+25 percent) to a decrease in alternative E (-72 percent). Total harvests in western Oregon would decline under all alternatives principally due to decreases in harvests on the national forests. Between 2001 and 2010 total harvests would increase even though harvests on BLM and national forest lands would not. Timber processed in western Oregon between 1993 and 2000 would decrease under all alternatives.

The cumulative effects of the alternatives are shown in table 4-A-1. This table shows projected timber harvests in western Oregon based on the assumption that each BLM district adopts the same alternative. The table does not include harvests in Klamath County because the BLM's share of total harvests in this county is so small. The reader should note that logs exported overseas are included in this total.

Sensitivity Analysis

Sensitivity analysis is a process used to identify specific trade-offs and opportunity costs associated with differing an alternatives approach to land-use allocations or management directions. This is done by examining how single changes in an alternatives management direction would affect the whole alternative. Such analyses can help design a Preferred alternative (PA) that best reconciles potential conflicts and optimizes overall benefits. Because of the large number of land-use allocation issues and plan alternatives, the BLM found it essential to focus the sensitivity analyses on the most sensitive or controversial issues and the mid-range alternatives. Some of the sensitivity analyses considered important early in the formulation of planning criteria were not conducted, as the evolution of planning issues and alternatives diminished their relevance.

Some of the sensitivity analysis conclusions on the effects of one change on the full alternative were reached by complex calculations using available analytical tools; however, many other conclusions were extrapolated and interpolated from the analysis of the effects on the full alternatives. This approach, rather than direct calculation, was always taken where calculation of the effects on the full alternatives was based on a ten-year timber management scenario developed for each alternative. The effort involved in developing and analyzing such a scenario for each sensitivity analysis was considered unwarranted due to the time and cost involved.

The following sensitivity analyses were conducted:

Since employment effects are linked to the ASQ, the estimated changes in the ASQ were based on calculations of changes in riparian acreages excluded from planned timber harvest. For alternatives B, C, and D, the changes in socioeconomic effects were analyzed by differing the levels of riparian zone protection,

Table 4-A-1. Cummulative Effects of Western Oregon Timber Harvest

Supplier	1984-88 Baseline	Alternative No Action	A	B	C	D	E	Preferred
Western Oregon Timber Harvest (1993-2000) per Year in Million Cubic Feet per Year[1]								
BLM	199	187	248	224	67	74	55	96
USFS[2]	377	175	175	175	175	175	175	175
Private (industrial & non-insutrial)	602	689	679	682	704	703	706	700
Other public	64	64	64	64	64	64	64	64
Total	**1,243**	**1,114**	**1,165**	**1,143**	**1,009**	**1,014**	**998**	**1,034**
Western Oregon Timber Harvest (2001-2010) in Million Cubic Feet per Year[3]								
Total	**1,243**	**1,224**	**1,281**	**1,259**	**1,113**	**1,122**	**1,103**	**1,140**
Western Oregon Timber Processed[4] (2001-2010) in Million Cubic Feet per Year[5]								
Total	**1,294**	**1,66**	**1,216**	**1,190**	**1,063**	**1,069**	**1,063**	**1,087**

[1]Totals do not include Klamath Falls Resource Area.
[2]Assumes implementation of most recent land management plans.
[3]Data source: Non-BLM harvest projections from Timber Supply Analysis for BLM Planning, USDA-USFS, PNW Research Station, Portland, OR, 1992.
[4]Timber processed from all sources was partitioned on county boundaries to approximate the BLM District. This analysis accounts for historic patterns of log flows across county boundaries. Assumes all BLM districts have implemented the same alternative. Includes logs exported overseas.
[5]Date Source: Timber Supply Analysis for BLM Planning, USDA-USFS, PNW Research Station, Portland, OR, 1992.

including legally required protection (the alternative A standard). For the PA, the effects of substituting alternatives A and E levels of protection and the level of protection suggested in October, 1991, by the Scientific Panel on Late-Successional Forest Ecosystems, in their watershed/fish emphasis option were analyzed.

For alternative A, the changes in socioeconomic effects and the effects on biological diversity and northern spotted owl habitat if the timber management areas and timber management prescriptions of alternative PA, were incorporated.

For alternatives B, C, D, and PA, the changes in socioeconomic effects and the effects on biological diversity and northern spotted owl habitat of differing the approaches to old growth and mature forest protection were evaluated. The differing approaches include:

- Managing the lands allocated to timber production in alternative B with no provision for protection of old growth and mature forests.
- Managing the lands allocated to timber production in alternative B on a 150-year rotation.
- Managing all lands allocated to timber production in alternatives B and C entirely under either of the partial retention approaches proposed in alternative C.
- Substituting the USFW's proposed northern spotted owl recovery plan for the older forest or spotted owl protection approach in alternatives B and D.
- Foregoing vegetation management and using release, pre-commercial thinning, and stand conversion in alternative PA. Analysis was separate for each practice as well as combined.
- Managing lands under the prescriptions of alternative PA but under the land allocation of alternative A.
- Allocating economically marginal lands to timber production in the Preferred alternative.

The conclusions of all these analyses are displayed in table 4-A-2.

Table 4-A-2. Sensitivity Analysis of Land-Use Allocations.

Allocation or Decision Element	Base Alternative	Changed Allocation	Estimated Changes (Comparison to Base Alternative): ASQ (mmcf) (Annual)	Total Local Employment (Jobs) (Annual)	County Revenue[4] ($1,000) (Annual)	Anadromous Fish Populations[1] (200 Years)	Spotted Owl Habitat[5] (100 Years)	Biological Diversity[2] (100 Years): Structural Diversity	Old Growth (Acres)
West Side									
Riparian Zone Protection[3]	B	Alternative A	+.0073	+.42	+$3.8		-	-	-
		Alternative C	-.0115	-.66	-$6.0		+	+	+
	C	Alternative A	+.0018	+.11	+$1.1		-	-	-
		Alternative B	+.0051	+.30	+$3.1		-	-	-
		Alternative D	-.0235	-1.39	-$14.1		+	+	+
	D	Alternative A	+.0499	+2.90	+$29.8		-	-	-
		Alternative C	+.0463	+2.73	+$27.6		-	-	-
		Alternative E	-.0716	-4.22	-$42.8		+	+	+
	Preferred	Alternative A	+.0037	+.20	+$2.1		-	-	-
		Alternative E	-.0745	-.40	-$4.3		+	+	+
Old Growth and Mature Forest Protection	B	No Protection	+1.58	+9.01	+$82.9		-	-	-
		150 Rotation on Managed Lands	-.210	-11.97	+$110.2		+	+	+
		Low Retention on Managed Lands	-1.085	-61.84	-$569.4		+	+	+
		High Retention on Managed Lands	-.985	-56.14	-$516.9		+	+	+
		Proposed Spotted Owl Recovery Plan	-.263	-14.99	-$138.0		+	+	+
	C	All Low Retention	-.055	-3.24	-$33.0		-	0	-
		All High Rentention	+.042	+2.48	-$25.3		+	0	+
		High Retention in R&R Blocks	+.105	+6.18	+$63.2		-	0	-
	D	Proposed Spotted Owl Recovery Plan	0	0	0		-	No Change	No Change
	Perferred	No Genetic Stock	0	0	0				

Table 4-A-2. Sensitivity Analysis of Land-Use Allocations (cont.)

Allocation or Decision Element	Base Alternative	Changed Allocation	Estimated Changes (Comparison to Base Alternative)						
								Biological Diversity[2] (100 Years)	
			ASQ (mmcf) (Annual)	Total Local Employment (Jobs) (Annual)	County Revenue[4] ($1,000) (Annual)	Anadromous Fish Populations[1] (200 Years)	Spotted Owl Habitat[5] (100 Years)	Structural Diversity	Old Growth (Acres)
Old Growth and Mature Forest Protection (cont.)	Perferred (cont.)	No Release and Pre-Commercial Thinning	-.042	-2.48	-$24.7				
		No Fertilization	0	0	0				
		No IntensiveManagement Practices (3 Preceding)	-.042	-2.48	-$24.7				
		Widened Buffer Strips For Watershed Protection	-.099	-5.84	-$58.2				
		UE Acres Added Back	+.008	+.47	+$4.7				
		No Harvest in OGEA	-0.42	-2.48	-$24.7				
		Maximum Lan Availablefor Timber Protection (alt. A base)	+.110	+6.49	+$64.6				
				East Side					
Riparian Zone Protection[3]	B	Alternative A	+.006	+.34	0			-	-
		Alternative C	-.003	-.17	0			+	+
	C	Alternative A	+.006	+.35	0			-	-
		Alternative B	+.004	+.24	0			-	-
		Alternative D	-.002	-.12	0			+	+
	D	Alternative A	+.009	+.53	0			-	-
		Alternative C	+.003	+.18	0			-	-
		Alternative E	-.006	-.35	0			+	+
	Preferred	Alternative A	+.006	+.34	0			-	-
		Alternative E	-.008	-.47	0			+	+
		No Stand Conversion	-.020	-1.18	0			-	-

[1]Anadromous fish do not have runs to this area.
[2]- = negative effect; + = positive effect.
[3]Increased riparian zone protection also contributes to biological diversity; and the reverse is true.
[4]*East side*lands are all public domain lands. By law, timber sale revenue from these lands are divided between the U.S. Bureau of Reclamation (76 percent), the U.S. Treasury General Fund (20 percent), and the State of Oregon (4 percent). Counties do not receive timber sale revenues from these lands.
[5]The *eastern portion* of the KFRA is outside the known range of the northern spotted owl.

Some sensitivity analyses performed for other districts were judged to have no effect on the Medford and Lakeview Districts, were incorporated within the design of their alternatives, or were not meaningful or analyzable in the silvicultural regimes used for the Medford and Lakeview Districts. These include:

- Some districts performed an analysis for alternative C in which lands allocated for timber production would be managed entirely for low retention timber harvests, but without harvesting in the oldest 20 percent of the stands in the first decades. In the TRIM-PLUS analyses for the Medford and Lakeview Districts the multiple canopied, often previously partial cut mature and old growth stands were combined on yield tables by subgroupings based on volume and structure, rather than by age, so that an age strata was not separated out. Testing of the sensitivity of the ASQ to differences in the age classes harvested for a single decade indicated that an ASQ change would be less than one percent.
- Some districts performed a sensitivity test for alternative D in which a minimum harvest age constraint of 60 years was used instead of 40 years. This comparison was not done for the Medford and Lakeview Districts, because they used partial cut yield tables with rotations of 100 years to reach the objectives for alternative D.
- Some districts performed a sensitivity test for alternative PA in which minimum harvest age was set at the age of cumulation of mean annual increment (see Glossary). Timber harvest for alternative PA for the Medford and Lakeview Districts were assigned older rotations of 120 to 200 years, therefore this test was not relevant.
- Some districts performed a sensitivity test of the effect of not accomplishing any stand conversion in alternative PA.
- Some districts performed a sensitivity test for alternative C in which acceleration of density management in the restoration and retention blocks would occur in the first decade. The possibility of such harvest in the Medford and Lakeview Districts was judged to be too small to be included in any sensitivity analysis.

In addition, some sensitivity analyses were done for alternative A as part of the analysis of the management situation. The analytical conclusions are displayed in table 4-A-3.

In addition, the analysis of the management situation provided economic efficiency analyses for the following intensive management practices: pre-commercial thinning, commercial thinning, fertilization, and brush and hardwood conversion. These efficiency analyses

Table 4-A-3. Sensitivity Analysis of Timber Management Prescriptions for Alternative A.

Sensitivity Analysis	First Decade ASQ mmcf	First Decade ASQ mmbf
West Side (Lakeview Portion of the Klamath SYU)		
Highest ASQ[1]	25	138
No Harvest Below Age of Culmination of Mean Annual Increment (CMAI)	N/A[2]	N/A
No Harvest of Stands Smaller than 12" Average Diameter	N/A	N/A
No Harvest of Stands Smaller than 16" Average Diameter	N/A	N/A
No Harvest of Stands Smaller than 20" Average Diameter	N/A	N/A
No Harvest of Stands Smaller than 24" Average Diameter	N/A	N/A
No Thinning, Fertilization or Stand Conversion	24	132
No Economically Marginal Practices	24	132

Table 4-A-3. Sensitivity Analysis of Timber Management Prescriptions for Alternative A (cont.).

	First Decade ASQ	
Sensitivity Analysis	**mmcf**	**mmbf**
East Side		
Highest ASQ[1]	3	15
No Harvest Below Age of Culmination of Mean Annual Increment (CMAI)	N/A	N/A
No Harvest of Stands Smaller than 12" Average Diameter	N/A	N/A
No Harvest of Stands Smaller than 16" Average Diameter	N/A	N/A
No Harvest of Stands Smaller than 20" Average Diameter	N/A	N/A
No Harvest of Stands Smaller than 24" Average Diameter	N/A	N/A
No Thinning, Fertilization or Stand Conversion	N/A	N/A
No Economically Marginal Practices	N/A	N/A

[1]In addition to the sensitivity analysis displayed, a maximum sustainable ASQ was calculated. If all BLM-administered forest lands, except Congressionally-designated areas, in the planning area were made available for timber harvest and funds for environmental mitigation and reforestation were unlimited, the annual sustainable harvest on the west side could be as high as 2.557 mmcf. On the east side, the annual sustainable harvest level could be as high as 0.285 mmcf.
[2]N/A = Not Aplicable

were based on the forestry practices of the 1980s and are less applicable to alternatives C and PA, particularly since the primary emphasis of many practices in those alternatives is attainment of biological diversity objectives, which can not easily be assigned economic value. The measure of economic efficiency is the amount of changè in net present value (NPV). Net present value is the sum of the value of revenues minus the costs during the life of the stand. All values are discounted to the time of harvest of the previous stand. If the change in the NPV from adding an intensive management practice is positive, it is considered economically efficient; that is, it adds more value than it costs.

All analyses, including discount rates, were based on values adjusted for inflation. This is called using real prices instead of nominal prices. The basis for expected timber stumpage prices is the average BLM timber sale price for the 1984-1988 period. For the primary analyses, future real wood price increases were estimated at 1.2 percent annually, based on the U.S. Forest Service's 1989 Resources Planning Act assessment. A discount rate of four percent was used because it was considered to best represent the long-term outlook. Analyses of pre-commercial thinning, commercial thinning, and fertilization for each site index were made of both understocked and well-stocked stands, assuming final harvest ages of 50, 60, 70, and 80 years. In general, fertilization or a combination of fertilization and commercial thinning resulted in a positive NPV for stands harvested at age 60.

For comparison and sensitivity testing, identical analyses were made using the following alternative assumptions: a zero percent real wood price increase and four percent discount rate; a 1.2 percent real wood price increase and seven percent discount rate; and a zero percent real wood price increase and seven percent discount rate. Under the first assumption,

commercial thinning resulted in a positive NPV in all tests and fertilization resulted in a positive NPV in about half of the analyses. Under the second assumption, commercial and pre-commercial thinning indicated a negative NPV for all analyses. Under the third assumption, the results were similar to those of the second assumption.

Analysis of hardwood, brush, or grass site conversion to conifer stands focused on estimating the maximum amount that could be spent on the practice and still achieve a positive NPV. Generalized conclusions about economic efficiency of this practice were not reached, because the cost of conversion varied widely from site to site. Among the relevant factors in site-specific analysis would be the stumpage value of any trees on a site. For a 1.2 percent real wood price increase with a 4 percent discount rate, up to $1,406 per acre could be spent if harvest was expected at age 60. The maximum dollar amount considered economically feasible for any site conversion declines as the harvest age lengthens. Under other economic assumptions tested (different real wood price increases and discount rates), the maximum dollar amount also declines.

Allowable Sale Quantity by Decade

Table 4-A-4. Allowable Sale Quantity (ASQ) and Long-Term Sustained Yield of the Alternatives for the Medford and Lakeview Districts (Klamath Sustained Yield Unit).

		Board Feet By Decade					
Alternative[1]	Cubic Feet	1st	2nd	3rd	5th	10th	20th
A	46,321,864	259,889,952	263,833,200	266,653,536	271,338,656	281,165,952	284,764,320
B	40,497,184	229,732,464	232,487,616	234,088,448	237,899,536	245,925,760	249,933,264
C	13,373,438	76,614,752	77,769,520	78,824,408	80,326,848	82,612,848	83,913,000
D	22,158,124	127,096,904	129,188,320	128,704,840	128,513,416	135,632,672	138,033,008
E	2,091,167	11,728,503	12,219,697	12,268,466	12,407,219	12,807,546	13,253,545
PA	14,484,380	82,862,752	84,159,664	85,121,208	87,799,760	89,617,464	89,729,664

[1]Since alternative NA was developed under the existing plan, the forest inventory has changed, and management practices that require the retention of overstory trees for frost protection have been implemented. The sustainability of alternative NA under current conditions is therefore uncertain and is not displayed in this table.

Table 4-A-5. Allowable Sale Quantity (ASQ) of the Alternatives[1] for the West Side of the Klamath Falls Resource Area.

	1st		2nd		3rd		5th		10th		20th	
Alternative[2]	CF	BF	CF	BF	CF	BF	CF	BF	CF	BF	CF	BF
A	24,825,603	138,025,180	25,039,616	141,519,648	25,392,315	144,991,051	26,267,288	152,150,302	27,738,537	167,791,242	28,434,630	174,552,552
B	21,032,811	118,487,828	21,370,480	121,911,742	22,060,160	126,441,389	22,730,791	132,180,020	23,822,280	144,172,658	24,327,732	149,955,328
C	7,907,296	45,118,815	8,007,718	46,371,334	8,650,462	47,237,289	8,650,874	51,780,984	9,216,847	56,820,607	9,397,912	58,877,438
D	16,739,500	95,507,906	15,953,876	92,667,346	15,978,111	91,416,266	16,278,946	93,422,154	16,276,114	98,508,549	16,268,096	101,366,976
E	1,824,182	10,304,716	1,433,348	8,189,050	1,455,012	8,343,481	1,512,003	8,818,142	1,568,558	9,426,060	1,605,065	9,987,425
PA	7,786,239	44,513,124	8,098,430	47,075,075	8,427,306	49,501,221	8,637,238	52,140,829	8,420,946	52,074,234	8,050,671	49,897,409

[1]Because the ASQ is calculated for the entire Klamath SYU, this table shows Klamath Falls' portion of table 4-A04. In each decade, the ASQ would vary depending on the age classes and management action for each district's portion of the SYU. The Klamath SYU would produce the same ASQ each decade.
[2]Since alternative NA was developed under the existing plan, the forest inventory has changed, and management practices that require the retention of overstory trees for frost protection have been implemented. The sustainability of alternative NA under current conditions is therefore uncertain and is not displayed in this table.

Table 4-A-6. Allowable Sale Quantity (ASQ) of the Alternatives for the East Side of the Klamath Falls Resource Area.

		Board Feet By Decade					
Alternative	Cubic Feet	1st	2nd	3rd	5th	10th	20th
NA	2,572,533	13,299,996	13,505,800	12,615,150	13,451,122	13,251,039	13,921,552
A	2,674,442	13,826,866	14,040,821	13,866,820	13,983,976	13,802,761	14,473,047
B	2,493,633	12,892,083	13,091,573	12,929,338	13,038,564	12,844,624	13,494,577
C	2,260,381	11,686,171	11,867,000	11,719,944	11,818,938	11,643,148	12,232,309
D	2,483,684	12,840,645	13,039,341	12,877,751	12,986,565	12,793,384	13,440,734
E	39,810	205,818	209,002	206,412	208,148	205,058	215,438
PA	2,485,666	12,850,891	13,049,745	12,888,026	12,996,924	12,803,590	13,451,459

[1]Since alternative NA was developed under the existing plan, the forest inventory has changed, and management practices that require the retention of overstory trees for frost protection have been implemented. The sustainability of alternative NA under current conditions is therefore uncertain and is not displayed in this table.

Timber Supply Analysis For BLM Planning

The purpose of this analysis is to report regional stumpage price[1], timber harvest on all ownerships, and log consumption within geographically defined subregions (figure 1) resulting from implementing each of the five common resource management plan alternatives, as well as the preferred alternatives, on all U. S. Department of the Interior Bureau of Land Management (BLM) Districts in western Oregon. The analysis covers a period of initial plan implementation (1993-2000)[2] and the period thereafter (2001-2010). The baseline period that provides a historical benchmark for comparison was 1984-1988.

The purposes of this appendix are to: summarize key concepts used to conduct the analysis, provide a description of the procedures used, and briefly compare the analysis results to the baseline period and an earlier outlook of western Oregon timber supply (Sessions 1990). Results appear in chapter 4 of the RMP/EIS describing the effects of alternatives. Specifically, the regional stumpage price results were used to calculate an index of BLM stumpage price changes (relative to the 1984-1988 baseline price). These price changes were then used in the assessment of personal income and employment effects. Harvest and log consumption results are presented in the timber supply tables of chapter 4.

Key Concepts

Implemented on all Districts, each set of similar resource management plan alternatives represented a different timber supply policy, or alternative theme, for BLM administered lands in western Oregon. The question being addressed by this analysis is how do changes in BLM timber supply policy affect how much timber is harvested and consumed in subregions of western Oregon? The subregions in figure 1 were explicitly interdependent through the transfer of logs from one subregion to another. The importance of subregions was in their partitioning of western Oregon into areas that differed in ownership distribution, private timber availability, and silvicultural management, while at the same time serving as logical reporting areas for western Oregon BLM Districts (see table 1).

[1]Definitions for terms such as regional stumpage price can be found in the terminology section following the main text.

[2]Actual data was completed through the end of 1990. Analysis results covering the 1991-2000 period were converted to an annual basis and reported for the 1993-2000 period since the BLM resource management plan implementation was assumed not to commence prior to 1993.

This analysis recognized that the BLM is just one timber supplier within western Oregon and that the impact of harvest changes is felt where the timber is actually consumed. Furthermore, any measure of the timber harvest and related consumption consequences of BLM actions must account for how the private land ownership reacts to changes in BLM timber supply policy. The amount of timber offered for sale by the BLM affects stumpage prices and these effects influence the decision of private forestland owners to harvest their timber. The result is an inverse relationship between the amount of BLM timber offered and the amount of private timber harvest.

The amount of timber demanded by processing mills is inversely related to stumpage prices. Timber demand is determined by factors outside the control of the BLM or any other forest land ownership category, such as end use consumption in the national economy (for example, the number of new homes being built) and other national economic variables like gross domestic product and the interest rate. Poor demand years result in low levels of consumption and low product prices; good years feature the same level of consumption under higher product prices. For the purpose of this analysis, year to year fluctuations in timber demand were averaged over a 10 year analysis period.

Timber supply is determined by ownership, subregional location, and stand condition. Ownership determines the policy specifying the conditions under which the timber may be harvested. Subregional location accounts for variations in species composition and the amount of timber available for harvest. Stand condition measures the amount of harvestable volume available on a per acre basis, as well as the growth rate and stage of development of this volume. Private timber supply is directly proportional to stumpage prices. This analysis accounted for changes in private timber supply by assessing inventory conditions at the beginning of each analysis period. For public agencies such as the USDA Forest Service and the BLM, timber supply is fixed at the planned allowable sale quantity; regardless of the stumpage price (down to a minimum acceptable bid), the same amount of timber would be harvested over the analysis period.

Market equilibrium defines a balance between timber supply and demand: the amount of timber harvested equals the amount of timber consumed and one stumpage price governs the exchange between suppliers and demanders. Implementing a new BLM timber policy will disrupt this balance and leads to

adjustments in the stumpage price such that a new timber supply and demand balance is created. In this analysis, market equilibrium is explicitly recognized for the Pacific Northwest - westside region, and this implies a local equilibrium within western Oregon subregions.

Procedure

The procedures used for the 1991-2000 period were: solving regional market equilibrium, disaggregation of the regional private harvest, displaying the timber harvest by ownership, and reapportioning the timber harvest as log consumption by processing facilities. Log exports from private and other public lands to foreign destinations was treated as domestic log consumption at the port of export.

In contrast, the procedures used over the 2001-2010 period were not dependent on a regional market equilibrium solution; rather the private harvest projections reflected the same behavioral response to the implemented resource management plans determined for the 1991-2000 period. This allowed the analysis to focus on whether the private inventory would provide a lower, same, or higher harvest over 2001-2010 when compared to the estimated 1991-2000 harvest.

Solving Regional Market Equilibrium; 1991-2000

This step determined the market adjustments, and associated regional stumpage price, that would result if a given set of resource management plan alternatives were implemented on BLM administered lands in western Oregon. The Timber Assessment Market Model (TAMM) (Adams and Haynes 1980, Haynes and Adams 1985, and Haynes 1990) was used to calculate the new regional stumpage price balancing timber supply and demand. The Timber Assessment Market Model was ideal for this kind of analysis since the model provided 50 year projections of consumption, production, and prices of forest products and stumpage under an array of externally specified conditions on policy and the economic environment surrounding the forest sector. The model is national is scope and is divided into 11 supply regions and 5 demand regions. Solution is in the form of a spatial supply and demand balance amongst regions. Therefore, the market equilibrium for the Pacific Northwest - westside region was dependent in part on what is happening in other regions of the U. S. Overall, the quantities produced and their distribution to demand regions is based on the maximization of producer profits net of transfer costs in each supply region.

The external policy condition that was changed for each TAMM run was the BLM sawtimber sale quantity resulting from holding each District in western Oregon at similar resource management plan alternatives. Four TAMM runs were made, each with a different resource management plan theme: current plans (i.e., no action), alternative A, alternative C, and the preferred alternative. Implementation of BLM resource management plans was assumed to commence in 1993. In order to reflect actual conditions since 1990, reported and estimated BLM sawtimber harvest quantities were used in 1991 and 1992 for all four runs. Similarly for 1991 National Forest harvest quantities. The National Forest sawtimber sale quantities for Pacific Northwest - westside forests in 1992 and beyond reflected planned offerings under the USDA Forest Service Spotted Owl Final Environmental Impact Statement, record of decision in March 1992 (U. S. Department of Agriculture 1992a and 1992b).

The key outputs for each TAMM run were the regional price and the total (hardwood and softwood) private growing stock removals for the Pacific Northwest - westside (PNWW) region. Growing stock removal was the relevant output because it represented the portion of total harvest that comes from the private inventory[3]. Annual removals from the industrial and other private ownership classes in TAMM (softwood and har&dwood volume combined) were summed to estimate the total private removal over the 1991-2000 period. The western Oregon share of the 1991-2000 PNWW total harvest was taken to be 0.4466, the historical 1971-1990 average of western Oregon's proportion of the total Pacific Northwest - westside private harvest (figure 2).

In summary, the regional market equilibrium solution resulted in a Pacific Northwest - westside regional stumpage price and western Oregon's share of the corresponding private growing stock removals, given a set of similar resource management plan alternatives assumed implemented on BLM administered lands in western Oregon. Table 2 contains the results of the regional market equilibrium for each resource management plan theme. Results for alternatives B, D, and E were interpolations of the results of the TAMM runs for alternatives, A, C, current plans, and preferred.

Disaggregation of the Private Harvest; 1991-2000

The disaggregation of the private harvest into western Oregon subregions used Connaughton and Campbell's

[3]Other harvest sources are from forestland conversions to other uses and dead and down large material.

(1991) probability of stand harvest model. Throughout most of western Oregon, the regeneration harvest type was clearcut, the exception being the Medford subregion where the harvest was either clear cut or partial cut depending on even-aged or uneven-aged stand management. Commercial thinning treatments, if appropriate, were applied to non-regeneration harvest acres. Volumes removed from thinning contributed to the disaggregation of western Oregon's share of the TAMM private harvest.

The application of Connaughton and Campbell's (1991) model required: an updated 1990 year-end inventory, stand growth and yield projections for all private lands, and calibration for changes in federal timber policy on National Forests that occurred subsequent to the 1976-1984 period of estimation for Connaughton and Campbell's model. The calibration procedure resulted in a mechanism for adjusting the probability of stand harvest for different BLM timber supply policies. Given the same stand conditions, the higher the regional stumpage price under the BLM policy, the greater the probability of stand harvest.

Inventory and Growth Projections for Private Timberlands

The growth and yield of western Oregon's private forests were simulated by projecting future stand conditions on each of 789 field plots measured by personnel from the Pacific Northwest Research Station in 1984 and 1985, and reported in Gedney and others (1986a), (1986b), and 1987). The plots are laid out over western Oregon in a systematic grid, and each represents a specific number of acres (plot expansion factor) determined by its subregional location and ownership. The sum of the expansion factors for all projected plots in western Oregon was 5,864,163 acres. All plots were capable of producing at least 20 cubic feet per acre per year of wood suitable for log consumption and were not reserved for purposes precluding timber harvest.

Most field plots are composed of five sample points distributed over five acres, with observations on tree species, diameter, and height recorded for each point. The stands on each point were separately projected and then summed to represent forest condition for the plot. Some plots had either very young stands with no measurable volume or were yet to be regenerated, and these were projected as if a uniform number of trees of a typical species mix and number of seedlings were present on each point.

Two stand simulators were used to project the stand conditions for each inventory plot: the Stand Projection System (SPS), Version 2.3a (revised 8/1/91; Arney 1985), and the Oregon Growth Analysis and Projection System (ORGANON), Version 3.0 (Hester et al 1989). The Stand Projection System was used for plots located in all subregions except Medford and Roseburg; ORGANON was used in the latter two subregions.

Silvicultural management regimes, which are a set of activities to be carried out as the stand develops, were assigned to each plot. The regimes varied by stage of stand development (young stands, established stands) and location. Table 3 lists and summarizes the regimes, and shows the total number of acres represented by the plots assigned to each regime. The 1991-2000 disaggregation, and the 2001-2010 projection, of the private timber harvest were not heavily influenced by any management activity other than harvesting itself. Commercial thinning and fertilization both had minor effects on the results: the former because it contributed to harvest and altered stand development; the latter because it accelerated growth.

Stand conditions were updated to 1990 for land use changes and harvesting that had occurred since the plots were measured in the mid-1980's. Photo-interpretation, field checks, and county tax assessment records were used to conduct the update. Growth between the mid-1980's and 1990 was projected using either SPS or ORGANON, depending on the subregion in which the plot was located.

Calibration for Changes in Federal Timber Policies

The variables determining Connaughton and Campbell's (1991) probability of stand harvest model are the anticipated compound growth rate for the stand and the stand's growing stock volume. Both of these variables are structured as a function of the time interval within which the probability of stand harvest applies. For example, Connaughton and Campbell's model was estimated using two successive inventories; the first representing 1976 conditions, the second 1985 conditions. The logic behind Connaughton and Campbell's model is to think of a private forest landowner viewing a stand in 1976 where the stand's growing stock volume is known. The 1976 to 1985 compound growth rate becomes a surrogate for the owner's anticipated growth rate for the stand over the next 10 years.

Since the model was actually estimated for a 9 year interval (1976-1984), the estimated probability of stand harvest represents the likelihood that the owner would harvest the stand sometime during the interval. Given that the plot represents numerous like stands; the estimated probability can be thought of the proportion

of area represented by the plot that would actually be harvested within the next 9 years[4]. For each subregion, the total private harvest was computed as:

$$\text{Total Private Harvest} = \Sigma_k (P_k V_k A_k) \qquad (1)$$

where:

P_k is the estimated probability of stand harvest (a value between 0 and 1 inclusive) for the subregion's kth plot.

V_k is the volume per acre of material available for harvest for the subregion's kth plot.

A_k is the area expansion factor (acres) for the subregion's kth plot.

The private harvest was further distinguished by industrial versus non-industrial ownership.

In western Oregon, public timber supply levels are large enough that changes in offerings from National Forests or the BLM will influence stumpage price. Therefore, the estimated probabilities using the reported coefficients in Connaughton and Campbell's (1991) model imply private harvesting behavior consistent with the federal policies in effect over 1976-1984 period. Given that the model was to be applied using the 1990 growing stock and the anticipated growth rate for the 1991-2000 period[5], their reported model coefficients had to be adjusted to reflect changes in National Forest timber supply policies since the 1976-1984 period. The simplest approach was to adjust the intercept term in Connaughton and Campbell's model for assumed changes in the private harvest behavior under different federal timber supply policies. This was done by iteratively solving for the new intercept term value for Connaughton and Campbell's model such that the computed probabilities, when applied to the total private harvest formula in (1) for all subregions, would result in western Oregon's share of the TAMM private harvest for the federal policy under investigation.

[4]In application, the 9 year area proportions were extrapolated to reflect harvested acreage over a 10 year period.

[5]The anticipated growth rate was calculated as the compound growth rate bringing the 1990 stand growing stock volume to its year-end 2000 counterpart in the absence of any scheduled thinning. The rationale applied here was that the owner's anticipated growth rate, for the purposes of identifying candidate stands for final harvest, would not be based on the stand being thinned over the period as well.

For example, western Oregon's share of the TAMM projected private timber harvest for the Pacific Northwest - westside region under a federal timber supply policy reflecting new National Forest plans (*circa* 1990) and the BLM under current plans adopted in the 1980's[6] is 668 million cubic feet per year (mmcf/year). In contrast, directly applying the estimated coefficients in Connaughton and Campbell's (1991) model to the updated 1990 inventory resulted in an independent 1991-2000 private harvest projection for western Oregon of 663 mmcf/year. The 663 mmcf/year projection represents an extrapolation of the 1976-1984 private harvest behavior to the 1991-2000 period. The question then becomes: What intercept term in Connaughton and Campbell's probability of stand harvest model, when applied to the 1990 stand conditions, would give probabilities that result in a private harvest calculation from the formula in 1 equal to the TAMM derived western Oregon private harvest of 668 mmcf/year?

Figure 3 summarizes the results of the calibration procedures. The regional stumpage price serves as an indicator of the regional market equilibrium for the federal timber supply policy assumed in effect over the 1991-2000 period. In general, the private harvest does not vary too much as a result of significant price differences associated with the various federal timber supply policies represented. Therefore, only minor adjustments to the intercept term in Connaughton and Campbell's (1991) model were necessary for the private harvest disaggregation. The closeness of the Connaughton and Campbell, and the TAMM National Forest (before new plans), results in figure 3 reflect that both projections assume a similar National Forest timber supply policy for the 1991-2000 period; namely timber sale offerings at the level existing over the 1976-1984 period.

Displaying the Timber Harvest by Ownership; 1991-2000

Five ownership groups were used to portray the timber harvest outlook, by subregion, for each BLM resource management plan theme considered: the BLM, National Forests, other public, non-industrial private, and industrial private. For all BLM alternatives, the National Forest harvest levels were held constant at the allowable sale quantity for the preferred alternative in the Final Environmental Impact Statement for the northern spotted owl (table 4). National Forest and BLM allowable sale quantities were pro-rationed to western Oregon subregions using the administrative

[6]Timber Assessment Market Model (TAMM90), log run 529.

area harvest pro-rationing factors used in Greber and others (1990). The other public harvest was also held constant at the observed 1984-1988 annual average for all BLM resource management plan alternatives.

Changes in the harvest by BLM resource management plan theme were due to differing BLM allowable sale quantities across alternatives, and the unique private harvest response to each BLM resource management plan theme considered. As discussed above, the private harvest disaggregation, by subregion, was based on a 10 year accumulation of the annual TAMM projections over the 1991-2000 period and then converted to an annual harvest rate for the period. While only labelled as occurring over the 1993-2000 period, the annual private harvest actually reflects the 1991-2000 rate of harvest which included 2 years (1991 and 1992) of same BLM harvest quantity for all BLM alternatives considered since plan implementation was assumed to commence in 1993.

Reapportioning the Harvest into Log Consumption; 1991-2000

The consumption of harvested timber by processing facilities within western Oregon was calculated using an average of the 1982 log flow information reported in Howard (1984a) and the 1988 log flow information reported in Howard and Ward (1991a). These two years contrasted periods of differing economic activity; the recession in 1982 and the recovery in 1988. Both the 1982 and 1988 log flows were adjusted for the amount of western Oregon timber processed out-of-state using Howard (1984b), Howard and Ward (1991b), Larsen and others (1983) and Larsen 1992). The data was expressed as fractions representing the proportion of timber harvested in one subregion processed in other subregions (including itself).

Log consumption was calculated as follows:

$$\mathbf{q} = \mathbf{h} \cdot \mathbf{LOGFLOW}. \qquad (2)$$

where:

q denotes a vector of log consumption, where q_i represents the amount of log consumption by processing facilities located in subregion i.

LOGFLOW denotes a matrix of log flow proportions containing elements α_{ij} representing the proportion of timber harvested within subregion i processed in subregion j; where $\Sigma_j \alpha_{ij} = 1$.

h denotes a vector of timber harvest, where h_i represents the total harvest from all ownerships in subregion i.

Updating the Private Inventory; Harvest and Log Consumption 2001-2010

Acres harvested for regeneration over the 1991-2000 period were removed from the inventory and unavailable for harvest during the 2001-2010 period. Thinned acres, plus non-harvested acres not scheduled for thinning, became the acres available for harvest over the 2001-2010 period. These acres were paired with year-end 2000 yields, mid-period 2005 harvest and thinning yields (if appropriate), and year-end 2010 yields (in the absence of thinning) for application of the Connaughton and Campbell (1991) probability of stand harvest model over the 2001-2010 period.

No further adjustments to the intercept term in Connaughton and Campbell's model were made for the 2001-2010 harvest projections. The rationale was a continuation of the resource management plans assumed implemented during the 1991-2000 period. Holding the intercept term constant indicated no further change in private harvesting behavior. What did change though was the available private harvest inventory that this behavior would apply to. That is, given the change in the composition of the private inventory resulting from growth and harvest removals over the 1991-2000 period, what quantity of private harvest would occur over the 2001-2010 period using the same intercept term in Connaughton and Campbell's model used in the 1991-2000 harvest projection? Differences in the private harvest projections for the 2001-2010 period, when compared to the 1991-2000 period, reflected harvest increases (or decreases) associated with the characteristics of the year-end 2000 inventory when compared to the year-end 1990 inventory.

The procedures used to display the timber harvest and log consumption for the 1991-2000 period were the same ones used for the 2000-2010 period. The harvest quantities for the BLM, National Forests, and other public ownerships were the same as reported for the 1991-2000 period. Therefore, the aggregate annual harvest total for 2001-2010, when compared to the 1991-2000 annual total, solely reflected differences in the private harvest.

What About the Klamath Resource Area of the Lakeview District?

The Bureau of Land Management's Klamath Resource Area administered by the Lakeview District is located outside boundaries used for this analysis. Therefore, private harvest responses to differing BLM allowable sale quantities by resource management plan alternative in the vicinity of the Klamath Resource Area

(Klamath County) were not provided by this analysis. However, some effects attributable to the Klamath Resource Area were still captured by the analysis.

The TAMM regional market equilibriums did include the Klamath Resource Area allowable sale quantities as BLM harvest volume originating within the Pacific Northwest - westside region; though technically the Klamath Resource Area is located on the eastern slope of the Cascade Range. This is reasonable since there is observed log flow from Klamath County into western Oregon counties. From a regional perspective it made more sense to lump the Klamath Resource Area as part of the total BLM effect on the Pacific Northwest - westside region rather than splinter out its small allowable sale quantity and model its regional impact on TAMM's Pacific Northwest eastern supply region. Finally, how differing allowable sale quantities by resource management plan alternative on the Klamath Resource Area effected western Oregon log consumption was provided by the analysis.

Results and Discussion

Table 5 summarizes the private harvest disaggregation for the 1991-2000 period and subsequent projections for the 2001-2010 period. Furthermore, table 5 compares these results to the 1984-1988 historical baseline, as well as earlier timber availability projections contained in Sessions (1990). There is little response in the western Oregon private harvest across BLM resource management plan themes since the stumpage price - private harvest response relationship in TAMM is inelastic (see table 2 and figure 3). For western Oregon as a whole, the private harvest projections vary across BLM resource management plan themes by 15-20 million cubic feet per year (table 5). This variation is even narrower (8-10 million cubic feet per year) for the 2001-2010 period.

When compared to the 1984-1988 baseline period, the 1991-2000 private harvest disaggregation, regardless of BLM resource management plan theme, exceed the 1984-1988 baseline harvest by 100 million cubic feet per year. The increase during the 1991-2000 period reflects a private harvest response to the regional stumpage price increase that occurred between the 1984-1988 period and the 1991-2000 projection period (table 2) as a result of the reduced timber supply offerings on National Forest lands. Furthermore, these harvest increases can be attributed to increases on the non-industrial private ownership since the 1991-2000 harvest disaggregation of the industrial ownership is lower than the 1984-1988 historical baseline (table 5). The proportion of private timberland harvested over the 1991-2000 period to the total private timberland acreage available at the end of 1990, ranged from 13 to 18 percent across subregions (higher percentages to the north) and was not substantially affected by the BLM resource management plan theme being considered. Thinned acres represented 2 to 9 percent of the area of private timberland existing in 1990.

Comparison of the 2001-2010 projections with the 1991-2000 harvest disaggregation shows a dramatic increase in the total private harvest, roughly 100 million cubic feet per year (table 5). This holds for all subregions except the South Coast and Medford. The increase reflects that young, fast-growing stands, not harvested over the 1991-2000 period become attractive for harvest (in the context of the landowner behavior in Connaughton and Campbell's (1991) probability of stand harvest model) in the 2001-2010 period. One important qualification for this harvest gain is that pre-1990 forest practice rules and related environmental constraints on the private timberlands remain unchanged through 2010. The proportion of private timberland harvested over the 2001-2010 period to the total private timberland acreage available at the end of 2000, ranged from 15 to 23 percent across subregions (higher percentage to the north). The proportion of private timberland area thinned ranged from 4 to 10 percent of the total private timberland acreage not harvested by 2000.

The timber availability projections in Sessions (1990), which contained no mechanism for adjusting private harvest quantities to stumpage prices, would underestimate the private harvest disaggregation for the 1991-2000 period. In addition, the Sessions' private harvest projections for periods subsequent to the year 2000 were constrained by an even flow condition. In contrast, the 2001-2010 harvest projections from this analysis reflect the flexibility of the private ownership to harvest within all available merchantable age classes without any restrictions regarding even flow. In all likelihood, the 2001-2010 harvest quantities in this analysis would exceed the Sessions' even flow requirement.

Table 6 summarizes the log consumption results by BLM resource management plan theme for the 1993-2000 and 2001-2010 reporting periods. For comparison purposes, the total western Oregon harvest from all ownerships is shown. Western Oregon was a net importer of logs over the 1984-1988 period as total consumption exceeds harvest (table 6). This pattern was not allowed to vary in this analysis. Since log consumption was a reapportioning of the timber harvest to where the volume is consumed, differences across BLM resource management plan alternatives

were minor and reflected the inelastic private timber harvest response to the different BLM allowable sale quantities.

For all BLM resource management plan themes, log consumption in western Oregon is projected to decrease when compared to the 1984-1988 baseline period. Most of this decrease is from reduced National Forest allowable timber sale quantities. The loss in consumption would have been greater had it not been for harvest increases on private lands; especially the non-industrial ownership (table 5). By the 2001-2010 period, further increases in both the industrial and non-industrial private harvest brings consumption close to historical levels. In addition, implementing alternatives A or B on all BLM administered lands in western Oregon would provide enough harvest to restore consumption to the 1984-88 historical level (table 6).

Terminology

Allowable Sale Quantity — Planned timber sale offerings from federal lands. For the USDA Forest Service, refers to offered quantities of sawtimber convertible to lumber or plywood. For the BLM, includes sawtimber and a small component of sound chippable material.

Analysis Period — Computation periods for the analysis. Period 1 covers the period of plan implementation (1991-2000) and period 2 covers the first period thereafter (2001-2010). Results for the 1991-2000 period are converted to an annual basis and reported for the 1993-2000 period since BLM resource management plan implementation was assumed to commence in 1993.

Baseline Period — Historical period used as a reference point for comparison of projected harvests. The period chosen by the BLM was the 1984-1988 period (U. S. Department of the Interior 1988).

BLM — U. S. Department of the Interior, Bureau of Land Management, Districts of western Oregon: Coos Bay, Eugene, Medford, Roseburg, Salem, and the Klamath Falls Resource Area of the Lakeview District.

Commercial Thinning — Removal of industrial crop trees to reduce competition among remaining trees in the stand, and thereby increase growth and yield of remaining trees. For purposes of growth and yield projections, assumed to occur during the fourth decade of stand development on slopes less than 35% slope (40-45% in the Medford subregion). Minimum volume and basal area restrictions were also applied in the Medford subregion to more realistically portray commercial thinning.

Fertilization — Application of nitrogen fertilizer to forest land to increase the rate of tree growth. For the projection of growth and yield, fertilization was assumed to be applied at a rate of 200 lbs/acre for eligible plots. Eligible plots were those of medium site productivity on the industrial ownership in all subregions except Medford. Application was assumed to occur during the third decade of stand development when preceding commercial thinning, and the fifth decade of stand development when preceding clearcut.

Log consumption — Volume of timber processed by manufacturing and export facilities throughout western Oregon. Calculated as a reapportioning of the western Oregon timber harvest using log flow information in Howard (1984a) and Howard and Ward (1991a). Also includes timber processed from eastern Oregon and out-of-state origins. Manufacturing includes primary end-uses such as lumber, plywood, and other products using sound chippable material. Includes logs exported to foreign destinations from western Oregon ports.

National Forests — Western Oregon National Forests of the USDA Forest Service Pacific Northwest Region: Mt. Hood, Rogue River, Siskiyou, Siuslaw, Umpqua, and Willamette.

Ownership, Owner Groups — See definition of timber harvest below.

Pacific Northwest - Westside (PNWW) Region — That portion of Oregon and Washington west of the Cascade Range divide.

Pre-commercial Thinning — Removal of young trees with no commercial value to provide growing space for future crop trees. For the projection of growth and yield, pre-commercial thinning was assumed to occur early in second decade of stand development when 60% or more of the plot's points had a stocking of more than 350 conifers per acre; lower stocking levels were permissible for the Medford subregion. Approximately 275 trees per acre were projected to remain after pre-commercial thinning.

Private Timberland — Private forestland capable of producing 20 cubic feet per acre per year of wood suitable for log consumption and were not reserved for purposes precluding timber harvest.

Probability of Stand Harvest — Refers to the likelihood that a inventory plot (representing a stand), given its growing stock volume of harvestable material and anticipate growth, will be harvested within a 10 year period. These probabilities were estimated by adjust-

ing Connaughton and Campbell's (1991) probability of stand harvest model for different federal timber supply policies. Each probability represents the proportion of plot's area expansion harvested over the 10 year period.

Regional Market Equilibrium - A balance between the quantity of timber supplied with the quantity of timber demanded (including volume exported for out-of-region consumption) for the Pacific Northwest - westside region. The quantity of timber supplied is reported as timber harvest, while the quantity of timber demanded is reported as log consumption.

Regional Stumpage Price — The market clearing regional stumpage price (in 1967 dollars per thousand board feet) that balances timber supply and demand for the Pacific Northwest - westside region. The average value of all species of timber harvested from USDA Forest Service National Forest lands in the Pacific Northwest - westside region was used as a proxy for the regional stumpage price. See Warren 1992; deflated to 1967 dollars per thousand board feet, Scribner. using the producer price index, all commodities (1967=100) reported in Ulrich (1988) and (1990).

Resource Management Plan Theme — Refers to the implementation of similar resource management plan alternatives on all BLM administered lands in western Oregon. The themes correspond to Alternatives A-E, current plans, and the Preferred alternative.

Stand Conditions — Refers to the per acre quantity (million cubic feet) of harvestable material on an inventory plot, or stand represented by an inventory plot. Also includes the compound rate growth over a specified 10 year period.

Subregion — Geographically defined reporting areas for timber supply and log consumption. They are defined to closely approximate the local areas proximate to BLM District boundaries. See figure 1 and table 1.

Timber Assessment Market Model (TAMM) — A supply and demand equilibrium model that provides 50 year projections of consumption, production, and prices of forest products and stumpage under an array of externally specified conditions on policy and the economic environment surrounding the forest sector (see Adams and Haynes 1980, Haynes and Adams 1985, and Haynes 1990).

Timber Demand — An inverse stumpage price - quantity relationship for logs. Timber demand is determined by factors outside the control of the BLM or any other forest land ownership category. This analysis accounts for timber demand in the regional market equilibriums calculated using the Timber Assessment Market Model.

Timber Harvest — Timber harvest is distinct from timber supply in that harvest represents tree volume removed from growing stock inventory and converted into primary end uses such as lumber, plywood, and other products using sound chippable material. Reported on an annual basis. Definitions by ownership groups are as follows:

Source of Change

<u>BLM</u> - USDI Bureau of Land Management planned 10 year allowable sale quantity for the Coos Bay, Eugene, Medford, Roseburg, and Salem Districts; and the Klamath Resource Area of the Lakeview District. Varies by resource management plan theme. Includes sawtimber and sound chippable material.

Estimated by the Analysis

<u>Industrial</u> - Ownership class of private lands owned by companies or individuals operating wood using plants. Also includes large corporate owners who manage lands for timber production but do not own or operate wood using plants. Harvest refers to net merchantable growing stock removals.

<u>Non-Industrial Private</u> - Ownership of private lands that does not meet the industrial classification. Includes small woodland owners and farmers. Harvest refers to net merchantable growing stock removals.

Held Constant Across all BLM Resource Management Plan Themes

<u>National Forest</u> - USDA Forest Service planned 10 year allowable sale quantity for Oregon National Forests west of the Cascade Range Divide (see table 4). This quantity only includes sawtimber material suitable for lumber or plywood manufacture.

<u>Other Public</u> - Observed 1984-1988 timber harvest from local, state, and federal (excluding BLM and National Forest) timberlands.

Timber Supply — Timber supply is a schedule of what quantity of trees may be removed given ownership policies, available inventory, and stumpage price. Timber harvest is an observable consequence of timber supply. Public forest owners were assumed to

have an inelastic timber supply schedule not responsive to stumpage price.

USDA Forest Service — U. S. Department of Agriculture, Forest Service.

Supporting Data

Actual 1991 and 1992 BLM Harvest — Used to initialize the TAMM projections for the actual level of BLM timber harvest for the first two years of the 1991-2000 analysis period. The 1992 harvest is an extrapolation of the observed harvest through March 1992. ***Source:*** USDI Bureau of Land Management, Portland, Oregon.

BLM Allowable Sale Quantities — Planned allowable sale quantities by western Oregon District for each resource management plan theme. ***Source:*** USDI Bureau of Land Management, Portland, Oregon.

BLM Chip Proportions — Proportion of BLM allowable sale quantity in sound chippable material. Used to convert reported BLM allowable sale quantities into sawtimber component since it is the sawtimber component that is necessary for input into TAMM. ***Source:*** USDI Bureau of Land Management, Portland, Oregon.

Exogenous Consumption — Logflow from the following county origins and processed within western Oregon subregions were held constant throughout the analysis: 1) Klamath county origin, 2) Other eastern Oregon counties, and 3) Out-of-State county origin. Annual volumes were the average of the 1982 and 1988 reported log flows from these origins into western Oregon. ***Source:*** Howard 1984a, Howard and Franklin 1991a.

Log Flows — Used to calculate log flow proportions used in log consumption calculations. ***Source:*** Larsen and others (1983), Howard (1984a), Howard (1984b), Howard and Ward (1991a), Howard and Ward (1991b), and Larsen (1992).

National Forest Allowable Sale Quantities — USDA Forest Service planned 10 year allowable sale quantity in million cubic feet per year. This quantity only includes sawtimber material suitable for lumber or plywood manufacture. This sale quantity assumes implementation of the Interagency Scientific Committee's conservation strategy for the northern spotted owl as indicated in the Final Environmental Impact Statement for the northern spotted owl (U. S. Department of Agriculture 1992a and 1992b). See table 4. ***Source:*** USDA Forest Service, Pacific Northwest Region, Portland, Oregon.

National Forest and BLM District Administrative Area Harvest Pro-rationing Factors — Represents the proportion of allowable sale quantity from an administrative unit (e.g., National Forest, BLM District) occurring within the boundaries of a particular subregion. ***Source:*** Adapted from supplemental information used in Greber and others (1990).

Other Public Harvest — Annual average for the 1984-1988 period as reported in the Oregon timber harvest reports (Oregon Forestry [1986], Oregon State Department of Forestry [1985, 1987], Oregon State Forestry Dept. [1988, 1989]). Converted to million cubic feet per year.

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Table 1: Subregion definitions for western Oregon.

SUBREGION	WESTERN OREGON COUNTIES	REPORTING AREA FOR BLM DISTRICT
North Coast	*Clatsop, Columbia, Tillamook, Washington.*	Salem District
Central Coast	*Benton, Lincoln, Polk, Yamhill.*	Salem District
North Willamette	*Clackamas, Multnomah, Hood River.*	Salem District
Mid-Willamette	*Linn, Marion.*	Salem District
Eugene	*Lane.*	Eugene District
Roseburg	*Interior Douglas*(1).	Roseburg District
South Coast	*Coos, Curry, and Coastal Douglas.*	Coos Bay District
Medford	*Jackson, Josephine.*	Medford District

Notes:

(1)The division between Coastal and Interior Douglas County follows the Coos Bay District boundary in Douglas County.

Table 2: Regional market equilibrium results by BLM resource management plan theme.

Bureau of Land Management		TAMM Equilibrium Results	
Resource Management Plan Theme	Allowable Sawtimber Sale Quantity (mmcf/year)	1991-2000 Regional Stumpage Price (1967 $/mbf)	1993-2000 Western Oregon Private Growing Stock Removals (million cubic feet per year)
1984-1988 Historical	197	$37.56	602
NO ACTION(1)	186	$74.22	689
A(2)	245	$70.03	679
B	221	$71.66	682
C(3)	66	$82.07	704
D	77	$81.54	703
E	55	$82.87	706
PREFERRED(4)	94	$80.18	700

mbf- thousand board feet, long log scale.
mmcf/year - million cubic feet per year.

Notes:

(1) Timber Assessment Market Model (TAMM90), log run 582.
(2) Timber Assessment Market Model (TAMM90), log run 583.
(3) Timber Assessment Market Model (TAMM90), log run 584.
(4) Timber Assessment Market Model (TAMM90), log run 587.

Table 3: Silvicultural management regimes used for projecting growth and yield for private lands in western Oregon.

Name of Regime	Acres Assigned To Regime	Management Activities	Comments
RX1, RX1A	2,245,471	Clearcut.	Applied to established stands not eligible for or needing other activities; RX1A allows fertilizer on industrial land in decade prior to clearcut
RX2, RX2B	1,149,234	Commercial Thinning, Clearcut	Applied to established stands that have sufficient stocking to benefit from commercial thinning; RX2B allows fertilization on industrial land prior to both thinning and clearcut.
RX3, RX3A	471,345	Pre-commercial Thinning Clearcut.	Applied to young stands that would benefit from stocking control; generally on ground too steep for commercial thinning; RX3A allows fertilization prior to clearcut on industrial lands.
RX4, RX4B	544,904	Pre-commercial and Commercial Thinning, Clearcut.	Applied to young stands that would benefit from stocking control and then benefit from commercial thinning prior to clearcut; RX4B allows fertilization prior to commercial thinning and clearcut on industrial lands.
RRX1	30,641	Establish Stand, Clearcut.	Applies to bare land or newly regenerated stands, typically on low sites.
RRX3, RRX3A	177,794	Establish Stand, Pre-commercial Thinning, Clearcut.	Applies to bare land or newly regenerated stands typically on ground too steep for commercial thinning; RRX3A allows for fertilizer on industrial ownership prior to clearcut.
RRX4, RRX4B	558,221	Establish Stand, Pre-commercial and Commercial Thinning, Clearcut.	Applies to bare land or newly regenerated stands suitable for both pre-commercial and commercial thinning; RRX4B allows fertilizer on industrial ownership prior to commercial thinning and clearcut.
SWRX1	416,932	Clearcut/Partial Cut.	Applied only in Medford subregion; same as RX1 except allows for a partial cut or clearcut as the regeneration harvest.
SWRX2	78,202	Commercial Thinning, Clearcut/Partial Cut.	Applied only in Medford subregion; same as RX2 allows for a partial cut or clearcut as the except regeneration harvest.
SWRX3	50,320	Pre-commercial Thinning, Clearcut/Partial Cut.	Applied only in Medford subregion; same as RX3 allows for a except partial cut or clearcut as the regeneration harvest.
SWRX4	8,387	Pre-commercial and Commercial Thinning, Clearcut/Partial Cut.	Applied only in Medford subregion; same as RX4 except allows for a partial cut or clearcut as the regeneration harvest.
SWRX5	68,908	Brush Control Clearcut/Partial Cut.	Applied only in Medford subregion; calls for brush control whenever stand is ineligible for pre-commercial thinning and 25% or more of trees are hardwoods.
None	63,779	Not Projected.	Site not suitable for conifer growing stock or other factors precluding management.

Table 5: Results for the 1993-2000 private harvest disaggregation and 2001-2010 projection by BLM resource management plan theme.

				Private Harvest, Western Oregon (million cubic feet per year)		
BLM Resource Management Plan Theme	**1993-2000**			**2001-2010**		
	IND	**NIPF**	**TOTAL**	**IND**	**NIPF**	**TOTAL**
Preferred Alternative (BLM ASQ = 96)	507	193	700	580	226	806
Current Plans (BLM ASQ = 190)	499	190	689	576	223	799
Alternative A (BLM ASQ = 251)	492	187	679	574	220	794
Alternative B (BLM ASQ = 227)	495	187	682	574	223	797
Alternative C (BLM ASQ = 68)	510	194	704	581	226	807
Alternative D (BLM ASQ = 76)	509	194	703	581	226	807
Alternative E (BLM ASQ = 56)	511	195	706	582	226	808
Timber Availability[1] (BLM ASQ = 190)	**544**	**125**	**669**	**557**	**125**	**682**

	IND	**NIPF**	**TOTAL**
1984-1988 Baseline (BLM Harvest = 202)	525	77	602

Notes:
- IND - Private industrial ownership.
- NIPF - Private non-industrial ownership.
- BLM ASQ - Bureau of Land Management resource management plans cumulative allowable sale quantity for western Oregon (million cubic feet per year). Includes the Klamath Resource Area of the Lakeview District.
- BLM Harvest - Bureau of Land Management actual harvest (million cubic feet per year).

[1] Sessions (1990).

Table 6: Log consumption results by BLM resource management plan theme.

BLM Resource Management Plan Theme	Log Consumption by Western Oregon Processing Facilities (million cubic feet per year)							
	1993-2000				2001-2010			
	HARV	END CNSMP	EXOG CNSMP	TOTAL CNSMP	HARV CNSMP	END CNSMP	EXOG CNSMP	TOTAL
Preferred Alternative	1,034	990	169	1,159	1,139	1,086	169	1,255
Current Plans	1,114	1,069	172	1,241	1,225	1,170	172	1,342
Alternative A	1,166	1,118	171	1,289	1,281	1,224	171	1,395
Alternative B	1,144	1,098	171	1,269	1,258	1,203	170	1,373
Alternative C	1,009	966	169	1,135	1,113	1,061	168	1,229
Alternative D	1,015	972	170	1,142	1,120	1,067	170	1,237
Alternative E	1,000	956	168	1,124	1,102	1,050	168	1,218
	HARV	END CNSMP	EXOG CNSMP	TOTAL CNSMP				
1984-1988 Baseline	1,248	1,196	172	1,368				

Notes:

HARV - Total harvest from all ownerships within western Oregon (million cubic feet per year).

END CNSMP - Consumption of logs originating from ownerships within western Oregon (million cubic feet per year). The difference between HARV and END CNSMP represents the volume of timber originating in western Oregon, but processed by out-of-state or eastern Oregon mills.

EXOG CNSMP - Consumption of logs originating from ownerships from eastern Oregon and out-of-state (million cubic feet per year). Differences reflect the effect of implementing different BLM resource management plan alternatives on Klamath Resource Area of the Lakeview District in eastern Oregon.

TOTAL CNSMP - Total log consumption (all origins) by western Oregon processing facilities (million cubic feet per year).

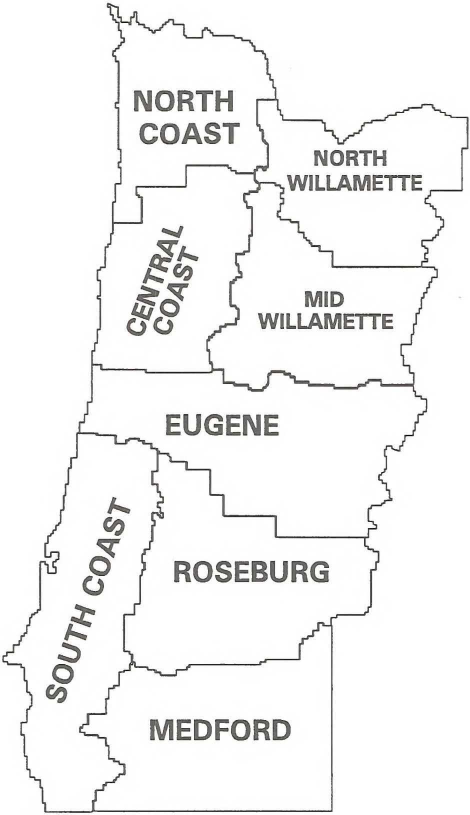

Figure 1: Western Oregon subregions.

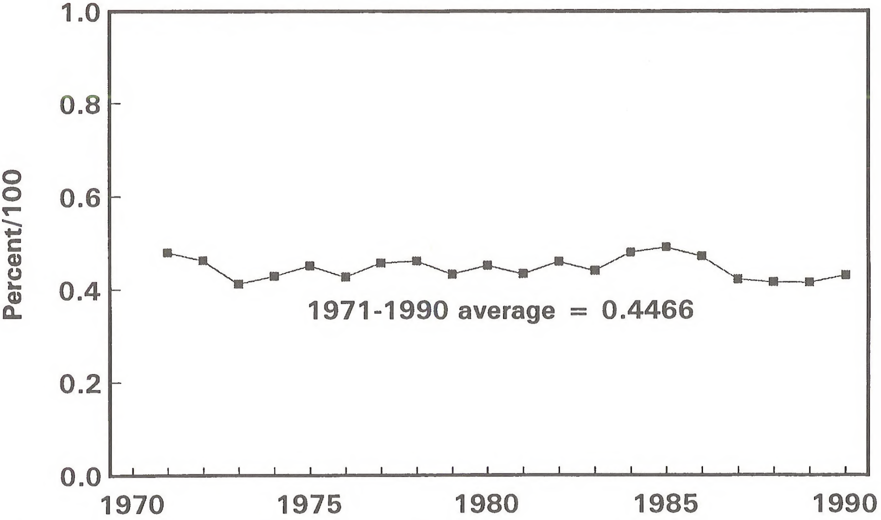

Figure 2: Western Oregon private timber harvest as a proportion of the Pacific Northwest - westside private harvest total.

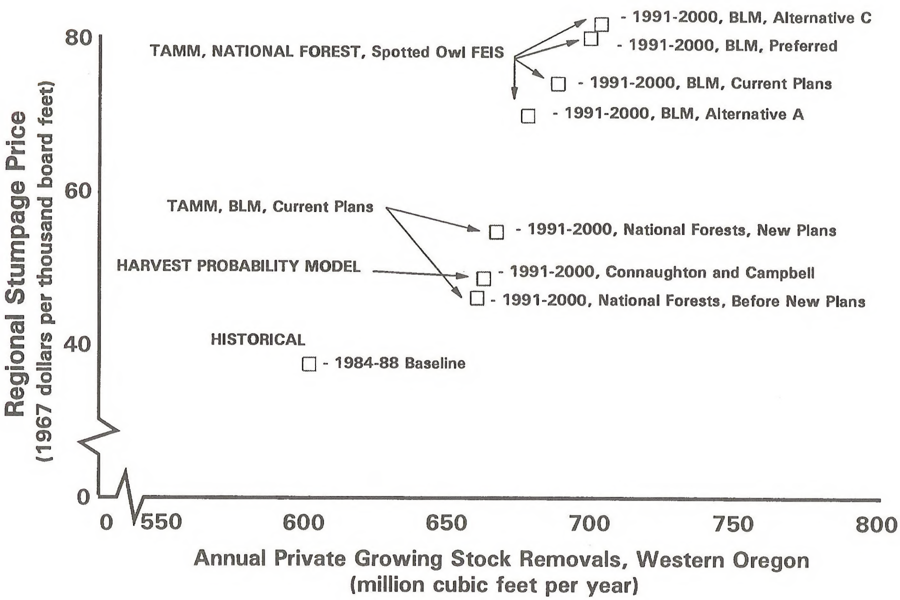

Figure 3: Private harvest calibration for changes in federal timber policy.

Appendix 4-B
Analytical Assumptions About Global Climate Change

Many scientists have predicted significant global warming within the next sixty years, due to increasing levels of carbon dioxide and other gases in the atmosphere. Others have hypothesized a climate change in western Oregon that would make it difficult or impossible to maintain, without change, the current ecosystems, including the major forest tree species. Among the relevant uncertainties, it is expected that warmer, drier weather would increase the incidence of wildfire, but warmer, wetter weather could reduce it. Rapid change could make the forest more susceptible to insect and disease attack because generational succession occurs much quicker quickly among pests than among trees. Other possible effects include increasing soil temperatures and lengthening summer droughts. This could shift the range of Douglas fir forests toward higher elevations, reduce the range of current high-elevation species, and increase the range of dryland species, such as lodgepole and ponderosa pine. Thus, management practices, particularly stand establishment and manipulation, could be affected. Assuring adequate tree regeneration would probably be the most serious management problem in areas that become marginal (Regens et al. 1989).

There is no scientific consensus about the expected extent or rate of global warming or the probable effect on forest ecosystems in western Oregon. Neither the environmental record nor the limited capabilities of the climate models permit a reliable forecast of climate changes (National Academy of Sciences 1991). Furthermore, available models show marked differences in their predictions of change for western Oregon (Joyce et al. 1990). In addition, the most commonly predicted temperature changes are not expected to affect woody biomass production or the dominance of Douglas fir in the region, although they could alter codominant species composition in older forests (Dale and Franklin 1989). At the high end of the range of predicted changes, however, are temperature increases that could be great enough, by around the middle of the 21st century, to inadequately meet the winter "chilling requirement" for Douglas fir to restart growth (Lavender 1989) in the spring.

The increasing carbon dioxide levels are generally thought to be beneficial to plant growth, but available information does not suggest which forest tree species may be most responsive to that increase or how their responsiveness may also be affected by any changes in the climate or by fertilization in managed forests.

Although climate change may occur and may, in a number of decades, affect the species composition of the forest, it is not considered likely to affect forestry practices during the life of the plan. Nonetheless, the draft plan incorporates a process of adaptive management (see the chapter 2 Use of the Plan section) permitting effective response to changing knowledge. Thus, should a scientific consensus emerge during the life of the plan, indicating that forestry practices should be modified promptly in anticipation of the effects of global warming, the BLM would be able to adjust.

Harmon et al. (1990) calculated that the past harvest of 5 million hectares (12.5 million acres) of old growth in the Pacific northwest accounted for 2 percent of the total carbon released because of land use changes in the last 100 years. The total added by all such land use changes increased atmospheric carbon by 25 percent. Thus, harvest of that 12.5 million acres added .05 percent to atmospheric carbon. By extension, each million acres of old growth harvested adds 0.04 percent.

Taken to the level of RMP/EIS analysis, each 10,000 acres of old growth that would be harvested (this assumes clearcutting) would add 0.0004 percent to total atmospheric carbon.

Appendix 4-C
Mineral and Non-Mineral Development Scenarios

Introduction

This appendix has 5 main sections, which describe the reasonably foreseeable development (RFD) scenarios for development of leasable, locatable, and salable mineral commodities and alternative non-mineral energy development. The purpose of the RFD scenario is to provide a model that anticipates the level and type of future mineral activity in the planning area, and would serve as a basis for cumulative effects analysis. The RFD scenario first describes the steps involved in developing a mineral deposit, with presentation of hypothetical exploration and mining operations. The current activity levels are discussed in chapter 3 of this document. Future trends and assumptions affecting mineral activity are discussed here, followed by the prediction and identification of anticipated mineral exploration and development. Finally there is a discussion on possible energy development scenarios (such as solar, wind, and pumped storage) for the planning area. The main focus of this section is the proposed Salt Caves hydroelectric project.

Scope

The development scenario is limited in scope to BLM-administered lands the planning area. The RFD scenario is based on the known or inferred mineral resource capabilities of the lands involved, and applies the conditions and assumptions discussed under Future Trends and Assumptions. Changes in available geologic data and/or economic conditions would alter the RFD, and some deviation should be expected over time.

Leasable Mineral Resources

Reasonably Foreseeable Development of Oil and Gas (Common to All Alternatives)

Future Trends and Assumptions. Based on the history of past drilling and foreseeable development potential in the Klamath Falls Resource Area (KFRA), activity over the next 10 to 15 years would continue to be sporadic. It is anticipated that oil and gas activity will consist of the issuance of some competitive and over-the-counter leases, a few geophysical surveys, and perhaps the drilling of one or two exploratory holes.

Because of the low potential for development of hydrocarbons, even though the potential for occurrence is moderate, the BLM does not anticipate the discovery of a producible oil and gas field during the life of this plan; however, to comply with the Supplemental Program Guidance for Fluid Minerals (Manual Section 1624.2), the potential surface effects associated with the discovery and development of a small oil and gas field are given in the section titled Oil and Gas Exploration and Development Scenario.

Oil and Gas Exploration and Development Scenario

Geophysical Exploration. Geophysical exploration is conducted to try and determine the subsurface structure of an area. Three geophysical survey techniques are generally used to define subsurface characteristics through measurements of the gravitational field, magnetic field, and seismic reflections.

Gravity and magnetic field surveys involve small portable measuring units that are easily transported via light off-road vehicles, such as four-wheel drive pickup trucks and jeeps, or aircraft. Both off-road and on-road travel may be necessary in these two types of surveys. Usually a three-man crew transported by one or two vehicles is required. Sometimes small holes (approximately 1 inch by 2 inches by 2 inches) are hand dug for instrument placement at the survey measurement points. These two survey methods can make measurements along defined lines, but it is more common to have a grid of distinct measurement stations.

Seismic reflection surveys are the most common of the geophysical methods, and they produce the most detailed subsurface information. Seismic surveys are conducted by sending shock waves, generated by a small explosion or through mechanically beating the ground surface with a thumping or vibrating platform, through the earth's surface. Usually four large trucks are used, each equipped with pads about 4-foot square. The pads are lowered to the ground, and the

vibrators are electronically triggered from the recording truck. Once information is recorded, the trucks move forward a short distance and the process is repeated. Less than 50 square feet of surface area is required to operate the equipment at each recording site.

The explosive method requires that small charges be detonated on the surface or in a drill hole. Holes for the charges are drilled using truck-mounted or air portable drills. The holes are of small diameter (2 to 6 inches) and reach depths of 100 to 200 feet. Generally 4 to 12 holes are drilled per mile of line and a 5- to 50-pound explosive charges is placed in the hole, covered, and detonated. The shock wave created is recorded by geophones placed in a linear fashion on the surface. In rugged terrain, a portable drill carried by helicopter can sometimes be used. A typical seismic drilling operation may use 10 to 15 men operating 5 to 7 trucks. Under normal conditions, 3 to 5 miles of line can be surveyed daily using this method. The vehicles used for a drilling program may include heavy truck-mounted drill rigs, track-mounted air rigs, water trucks, a computer recording truck, and several light pickup trucks for the surveyors, shot hole crew, geophone crew, permit man, and party chief.

Public and private roads and trails are used where possible; however, off-road cross-country travel is necessary in some cases. Graders and bulldozers may be required to provide access to remote areas. Several trips a day are made along a seismograph line, usually resulting in a well defined 2-track trail. Drilling water, when needed, is usually obtained from private landowners.

The surface charge method uses 1- to 5-pound charges attached to wooden laths 3 to 8 feet above the ground. Placing charges lower than 6 feet usually results in the destruction of vegetation, while placing the charges higher, or on the surface of deep snow, results in little visible surface disturbance.

It is anticipated that two notices of intent, involving seismic reflection and gravity/magnetic field surveys, would be filed under any of the alternatives during the life of the plan.

Drilling Phase. Once the application to drill is approved, the operator may begin construction activities in accordance with stipulations and conditions. When a site is chosen that necessitates the construction of an access road, the length of road may vary, but usually the shortest feasible route is selected to reduce the haul distance and construction costs. Environmental factors or a landowner's wishes could dictate a longer route in some cases. Drilling activity in the planning area is predicted to be done using existing roads and only constructing short (approximately 1/4 mile) roads to access drill site locations.

Based on past oil and gas drilling in Oregon, it is projected that one or two exploratory wildcat wells would be drilled on BLM-administered land in the planning area. The estimated success rate of finding hydrocarbons is predicted to be no greater than 10 percent, based on the average wildcat well success rate. Drilling is expected to be in areas of moderate oil and gas potential. This is the highest level of potential for the occurrence of oil and gas in the planning area. There is approximately a 1 in 50 chance of a new field discovery during the life of the plan, with a strong likelihood that any such discovery would be natural gas, since current western Oregon production is gas.

During the first phase of drilling, the operator would move construction equipment over existing maintained roads to the point where the access road begins. Less than 1/4 mile of moderate duty access road with a cinder or gravel surface 18 to 20 feet wide is anticipated for construction. The total surface disturbance width would average 40 feet with ditches, cuts, and fills. The second part of the drilling phase would be the construction of the drilling pad or platform. The likely duration of well development, testing, and abandonment is predicted to be less than 12 months per drill site. The total disturbance for each exploratory well and any new road construction to the drill site is expected to be less than 6 acres. The total surface disturbance caused by exploratory drilling over the life of the plan is expected to be less than 12 acres.

Field Development and Production. No field development is expected to occur during the life of the plan; however, the following scenario describes the operations and effects associated with field development and production.

> Small deposits of oil or gas discovered in the planning area would not be economic to develop. The minimum size considered economically feasible would be a field containing reserves of 50 to 60 billion cubic feet of gas over a productive life span of 10 years. The total area of such a field would be 200 acres with a likely well spacing of 160 acres. The field would require four development wells in addition to the discovery well. Each development well would require 1/4 mile of road. Development well access roads would be cinder or gravel surfaced and would have a width of about 20 feet. The width of the surface disturbance associated with roads would average 40 feet. Gas produced would be carried by pipelines which

could possibly be linked to the existing and proposed gas transmission lines in the planning area. Average pipeline length is estimated at 30 to 40 miles. The width of surface disturbance for pipelines would average 30 feet. Any oil produced would be trucked to refineries outside of Oregon. Well servicing requirements would be provided by established service companies.

The total surface disturbance would be 8 acres for well pads; 5 acres for roads; 13 acres for field development; and 600 acres for pipelines. The total surface disturbance caused by exploration and development over the life of the plan would be 670 acres.

Plugging and Abandonment. Wells that are completed as dry holes are plugged according to a plan designed specifically for the conditions of each well. Plugging is accomplished by the placing of cement plugs at strategic locations in the hole. Drilling mud is used as a spacer between the plugs to prevent communication between fluid bearing zones. The drill casing is cut off at least 3 feet below ground level and capped by welding a steel plate on the casing stub. After plugging, all equipment and debris would be removed and the site restored as near as reasonably possible to its original condition. It is predicted that the one anticipated exploratory well that would be drilled would be plugged and abandoned.

Reasonably Foreseeable Development of Geothermal Resources (Common to All Alternatives)

Future Trends and Assumptions. Since environmental protection and enhancement are major concerns in the Pacific Northwest, clean, low-impacting energy sources are becoming more important. The energy *surplus* in the region is expected to disappear by the end of the decade. The abundant geothermal resources thought to be present in the northwest are essentially undeveloped. To encourage resource development, the Bonneville Power Administration is offering to participate in three geothermal pilot projects. One of the projects selected is in the Medicine Lake Highlands area in northern California, just south of the planning area. With this renewed interest in geothermal energy it is anticipated that areas exhibiting geothermal potential, such as Klamath Falls, will experience an increase in geothermal exploration and possibly development.

Geothermal Operations

Geophysical/Geochemical Exploration. As with oil and gas, geothermal/geophysical operations can take place on leased or unleased public land. Depending upon the status of the land (leased or unleased), the status of the applicant (lessee or non-lessee), and the type of geophysical operation proposed (drilling or non-drilling), several types of authorizations can be used if the proposed exploration exceeds *casual use,* as defined in 43 CFR 3209.0-5(c). In all cases, the authorizations require compliance with the National Environmental Policy Act and approval by the authorized officer (appropriate level BLM signing official). As with oil and gas, the operator is required to comply with all terms and conditions of the permits, regulations, and other requirements, including reclamation, prescribed by the authorized officer. Monitoring for compliance with these requirements would be done during the execution and upon completion of the operations.

In addition to the geophysical methods discussed in the Oil and Gas section, the following exploration techniques are often employed in geothermal prospecting:

Microseismic. Small seismometers are buried at a shallow depth (hand-dug holes) and transmit signals from naturally-occurring, extremely minor seismic activity (micro-earthquakes) to an amplifier on the surface. Stations are located away from roads to avoid traffic *noise.* These units are often backpacked into areas inaccessible to vehicles.

Resistivity. Induced polarization (IP) techniques are used to measure the resistance of subsurface rocks to the passage of an electric current. A vehicle-mounted transmitter sends pulses of electrical current into the ground through two widely spaced electrodes (usually about two miles apart). The behavior of these electrical pulses as they travel through underlying rocks is recorded by *pots* (potential electrodes), small ceramic devices that receive the current at different locations. The electrodes are either short rods (2 or 3 feet long) driven into the ground, or aluminum foil shallowly buried over an area of several square feet. Two or three small trucks transport the crew of 3 to 5 people to transmitting and receiving sites.

Telluric. A string of *pots* record the variations in the natural electrical currents in the earth. No transmitter is required. Small trucks are used to transport the crew and equipment.

Radiometric. Radioactive emissions (generally radon gas) associated with geothermal resources are usually measured using a hand-held scintillometer, often at hot spring locations. Another method used involves placing plastic cups containing small detector strips sensitive to alpha radiation either on the surface or in shallow hand-dug holes. If holes are dug, they are covered, and the cups left in place for 3 to 4 weeks. At the end of the sampling period, the cups are retrieved and all holes are backfilled. These surveys can be conducted by walking to the sites or with the aid of light vehicles.

Geochemical Surveys. Geochemical surveys are usually conducted at hot springs by taking water samples directly from the spring. Sampling for mercury associated with geothermal resources is often done by taking soil samples using hand tools. These surveys can be conducted by walking to the sites or with the aid of light vehicles.

Temperature Gradient Drill Hole Surveys. Temperature gradient holes are used to determine the rate of change of temperature with respect to depth. Temperature gradient holes usually vary in diameter from about 3.5 to 4.5 inches, and from a few hundred feet to 5,000 feet in depth. They are drilled using rotary or coring methods. Approximately 1/10th to 1/4 acre per drill hole would be disturbed. A typical drill site could contain the drill rig, most likely truck-mounted; water tank(s); fuel tank; supply trailer; and a small trailer for the workers. Drilling mud and fluids would be contained in earthen pits or steel tanks. Water for drilling would be hauled in water trucks, or if suitable water sources are close, could be piped directly to the site. Water consumption could range from about 2,000 to 6,000 gallons per day, with as much as 20,000 gallons per day under extreme *lost circulation* conditions.

Other equipment that could be used includes large flatbed trucks to haul drill rod, casing, and other drilling supplies; in some cases special cementing and bulk cement trucks; and two or three small vehicles for transporting workers. In most cases, existing roads would be used. It is estimated that short spur trails (usually less than a few hundred yards long) would be bladed for less than 10% of these holes. All holes would be plugged and abandoned to protect both surface and subsurface resources, including aquifers, and reclamation of disturbed areas would be required, unless some benefit to the public could be gained (for example, a water well or camping area).

Depending upon the location and proposed depth of the drill hole, detailed plans of operation that cover drilling methods, casing and cementing programs, well control, and plugging and abandonment could be required.

Based upon past geothermal exploration in Oregon, and a projected increase in power demand in the northwest by the end of the decade, it is anticipated that during the life of the plan, six notices of intent for surface geophysical surveys, and five notices of intent to drill 30 temperature gradient holes, would be filed under any alternative. These notices of intent would most likely be filed within the Klamath Falls known geothermal resource area (KGRA) and the Swan Lake area.

Drilling and Testing. Drilling to detect the presence of, test, develop, produce, or inject geothermal resources can be done only on land covered by a geothermal resource lease.

A typical geothermal well drilling operation would require 2 to 4 acres for a well pad, including reserve pit, and 1/2 mile of moderate duty access road with a surface 18 to 20 feet wide and totalling up to 40 feet in width with ditches, cuts, and fills. Existing roads would be used whenever possible. Total surface disturbance for each well, and any new road is expected to be less than 6 acres. In some cases, more than one production well could be drilled from one pad. Well spacing would be determined by the authorized officer after considering topography, reservoir characteristics, optimum number of wells for proposed use, protection of correlative rights, potential for well interference, interference with the multiple uses of the land, and protection of the surface and subsurface environment. There would be close coordination with the State of Oregon. It is anticipated that the duration of well development, testing, and if dry, abandonment, would be 4 months.

Plugging and Abandonment. Prior to abandonment, the operator would be required to plug the hole to prevent contamination of aquifers and any effects to subsurface and surface resources. Plugging would be accomplished by placing cement plugs at strategic locations in the hole. Depending upon the formations encountered, drilling mud could be used as a spacer between plugs to prevent communication between fluid bearing zones. The drill casing would be cut off at least 6 feet below ground level and capped by welding a steel plate on the casing stub. After plugging, all equipment and debris would be removed, and the site

restored as near as reasonably possible to its original condition. A dry hole marker is often placed at the surface to identify the well location. If the surface owner prefers, the marker may be buried. Any new roads not needed for other purposes, would be reclaimed.

It is estimated that three exploratory wells would be drilled under all alternatives during the life of the plan.

Geothermal Power Plant Development. It is projected that one power plant generating 24 megawatts of electricity (gross), would be constructed within the Klamath Falls KGRA under all alternatives during the life of the plan. It is anticipated that the developed geothermal resource would be water-dominated and that the geothermal power conversion system would either be single or double flash, or binary cycle. Before geothermal development could occur, site-specific baseline studies and environmental analyses, with public involvement, would be done. The scenario below describes the level of disturbance that would likely occur from the development of a 24 megawatt power plant.

> Five to seven production wells and one or two injection wells would be drilled. It is anticipated that access would be provided by existing roads, and the construction of short roads (1/2 to 1 mile long) with a surface of 18 to 20 feet wide and totalling up to 40 feet in width with ditches, cuts, and fills. Surface disturbance from well pad and road construction would probably range from 2 to 6 acres per well. The power plant facility, including separators, energy converters, turbines, generators, condensers, cooling towers, and switchyard, would involve an estimated 10 to 15 acres. Pipelines and powerlines would disturb an additional 3 to 6 acres. If a water cooling system is employed, 1 to 3 water wells, requiring about 1/4 acre per well, would be drilled, unless the cooling water was obtained from the geothermal steam condensate. Depending upon the location, terrain, geothermal reservoir characteristics, and type of generating facility the total surface disturbance for a 24 megawatt (gross) geothermal power plant, and ancillary structures, would probably range from about 26 to 76 acres, or about 1 to 3 acres per megawatt. After construction, approximately 1/3 to 1/2 of the disturbed area would be revegetated. Prior to abandonment, the remaining disturbed area would be reclaimed.

Direct Use of Geothermal Energy. Low- and moderate-temperature (50 to 300 degrees Fahrenheit) geothermal resources have many direct applications. Direct applications, and potential development scenarios, include space heating and cooling of residences and businesses, applications in agriculture, aquaculture, and industry; and recreational and therapeutical bathing. Depending upon the type of use and magnitude of operation, surface disturbance could range from a few acres for a well and greenhouses, or food processing facility, to tens of acres for larger agricultural or aquacultural developments. It is anticipated that during the life of the plan two wells would be drilled to support one geothermally-heated greenhouse operation within the Klamath Falls KGRA under all alternatives.

Locatable Mineral Resources

Reasonably Foreseeable Development Scenarios (Common to All Alternatives)

Future Trends and Assumptions. The major commodities of interest would continue to be the precious metals, gold and silver. This is based on a combination of price (especially for gold) and the favorable geology for mineral occurrences. Reclamation science would continue to advance due to experience and research. More detailed design effort would be placed on the reclamation of mined lands in the future. This would result in an overall increase in reclamation costs but those costs should pay dividends in the long term with increased reclamation success.

The economics of mining in the planning area would be driven by the relationship between production costs and the market price of the commodity. While production costs can be controlled, or anticipated through management and technology, the big unknown would be in the price of the mineral commodity, especially gold. The overall profitability of an operation, and hence the level of activity at the prospecting, exploration, and mining phases, for development of ore bodies would be closely related to the price of the mineral commodity.

No chemical heap leaching operations are anticipated during the life of the plan. If such an operation is proposed during the life of the plan, it will be subjected to environmental review under a plan of operations pursuant to regulations found in 43 CFR 3809.

Background on the Development of a Locatable Minerals Mine

The development of a mine from exploration to production can be divided into four stages. Each stage requires the application of more discriminating (and more expensive) techniques over a successively smaller land area to identify, develop, and produce an economic mineral deposit. The full sequence of developing a mineral project involves reconnaissance, prospecting, exploration, and mine development.

Reconnaissance. Reconnaissance level activity is the first stage in exploring for a mineral deposit. This activity involves an initial literature search for the area of interest, using available references, such as publications, reports, maps, and aerial photos. The area of study can vary from hundreds to thousands of square miles. Activity that would normally take place includes large scale mapping, regional geochemical and geophysical studies, and remote sensing with aerial photography or satellite imagery. These studies are usually undertaken by academic or government entities, or major corporations. The type of surface disturbing activity associated with reconnaissance level mineral inventory is usually no more than occasional stream sediment, soil, or rock sampling. Minor off-road vehicle use could be required.

Prospecting. As the result of anomalous geochemical or geophysical readings, unique geologic structures or features, occurrence of typical mineral bearing formations, or a historical reference to past mineral occurrence, the prospecting area of interest is identified. This area could range from a single square mile to an entire mountain range of several hundred square miles.

Activity that would take place in an effort to locate a mineral prospect includes more detailed mapping, sampling, geochemical, and geophysical study programs. This is the time when property acquisition efforts usually begin and most mining claims are located in order to secure ground while trying to make a mineral discovery. Prospecting on an annual basis is considered a minimum requirement, under the mining laws, to secure a claim.

The types of surface disturbing activity associated with prospecting involve more intense soil and rock chip sampling, using mostly hand tools; frequent off-road vehicle use; and placement and maintenance of mining claim monuments. This activity is normally considered *casual use* (43 CFR 3809.1-2) and does not require BLM notification or approval.

Exploration. Upon location of a sufficiently anomalous mineral occurrence, or favorable occurrence indicator, a mineral prospect is established and is subjected to more intense evaluation through exploration techniques. Activities that take place during exploration include those used during prospecting, but at a more intense level and in a smaller area. In addition, activities, such as road building, trenching, and drilling, are conducted. In the later stages of exploration, an exploratory adit or shaft may be driven. If the prospect already has underground workings these may be sampled, drilled, or extended. Exploration activities use mechanized earth moving equipment, drill rigs, etc., and may involve the use of explosives.

Typical exploration projects in the planning area could include: in-stream dredging with portable suction dredges; exploratory drilling, which could include construction of new roads; use of explosives to sample rock outcroppings; and excavation of test pits. If the exploration project disturbs 5 acres or less, it is conducted under a *notice* (43 CFR 3809.1-3) which requires the operator to notify BLM 15 days before beginning the activity. A copy of each notice received is sent to the Oregon Department of Geology and Mineral Industries for their review. If the project disturbs more than 5 acres, it is conducted under a plan of operations (43 CFR 3809.1-4) and requires National Environmental Policy Act (NEPA) compliance before approval.

Mine Development. If exploration results show that an economically viable mineral deposit is present, activity would intensify to obtain detailed knowledge regarding reserves, possible mining methods, and mineral processing requirements. This would involve applying all the previously used exploration tools in a more intense effort. Once enough information is acquired, a feasibility study would be made to decide whether or not to proceed with mine development and what mining and ore processing methods would be used.

Once the decision to develop the property is made, the mine permitting process begins. Upon approval, work begins on development of the mine infrastructure. This includes construction of the mill, offices, and laboratory; driving development workings if the property is to be underground mined, or prestripping if it is to be open pit mined; building access roads or hauling routes; and placement of utility services. During this time additional refinement of the ore reserves is made.

Once enough facilities are in place, actual mine production begins. Concurrent with production there are often satellite exploration efforts to expand the

mine's reserve base and extend the project life. Reclamation of the property is conducted concurrently with, or upon completion of, the mining operation. Often uneconomic resources remain unmined and the property dormant until changes in commodity price or production technology makes these resources economically feasible to mine.

Activities that occur on these lands include: actual mining, ore processing, tailing disposal, waste rock placement, solution processing, metal refining, and placement of support facilities, such as repair shops, labs, and offices. Such activities involve the use of heavy earthmoving equipment and explosives for mining and materials handling, exploration equipment for refinement of the ore reserve base, hazardous or dangerous reagents for processing requirements, and general construction activities.

The size of mines varies greatly and not all mines would require all the previously mentioned facilities and equipment. Acreage involved can range from several acres to several hundred, with most projects disturbing 5 acres or less and requiring a notice pursuant to 43 CFR 3809.1-3. Projects disturbing more than 5 acres require an approved plan of operations pursuant to 43 CFR 3809.1-4.

Reasonably Foreseeable Development

Based on the mineral exploration activity of the last planning period, and recent discoveries of Tertiary epithermal disseminated gold deposits, it is anticipated that four notices for disseminated gold exploration would be submitted under all alternatives during the life of the plan. It is predicted that approximately ten holes would be drilled using truck mounted drill rigs for each notice. Drill sites would disturb less than 1/10th of an acre. Temporary access roads, 10 to 12 feet wide, would be constructed for about 1/3 of the drill holes, but in most cases the existing roads would be used. Drill holes would be plugged in accordance with state and federal regulations, and reclamation, including rehabilitation of drill pads and access roads, would be conducted at the conclusion of the exploration program.

In addition to the gold exploration mentioned above, it is anticipated that two notices for in-stream suction dredging would be filed under all of the alternatives. In-stream dredging is usually a one or two person operation using a floating suction dredge with a 5 to 7 horsepower engine. The dredge pulls up all the gravel in the stream down to bedrock. The gravels are passed over a sluice box and are returned to the stream without the gold. This process does not require any chemicals. Most of the dredges have an intake nozzle opening less than 5 inches in diameter. Other activities associated with dredging include temporary occupancy and minor road and trail construction. These operations will be monitored pursuant to the regulations found in 43 CFR 3809.1-3.

Salable Mineral Resources

Reasonably Foreseeable Development Scenarios

Future Trends and Assumptions. The major use of salable minerals (primarily rock and cinders) would continue to support the timber program. Because major haul roads are already constructed and in good condition, it is expected that the demand for rock and cinders would not vary significantly between the alternatives. It is anticipated that rock and cinders would be needed in about the same quantities as in the past for maintenance and construction of county and state roads and highways. Public demand would probably remain minimal for these salable minerals, with a slight increase in demand for decorative rock (in all the alternatives).

Existing quarries and pits would most likely be used for obtaining the cinder and rock, but new site development is not precluded by this plan.

Projected Quarry and Cinder Development Scenario (Common to All Alternatives)

Existing and new quarry and cinder sites, on the average, disturb approximately 2 or 3 acres of land. This acreage is necessary for the mine itself, rock crushing operations, truck turn-around areas, access trails for bulldozers and drills, overburden stockpile sites, and aggregate stockpile areas. For access to a new quarry site, approximately 1/2 acre of land would be disturbed by new road construction, most often affiliated with a timber sale contract. Upon depletion, reclamation work would be conducted on the material sites as well as all unneeded access roads and trails.

It is expected that the 18 existing quarry and cinder sites in the planning area would be used intermittently throughout the life of the plan, and that one or two new sites would be opened up. Any existing pit expansion that causes surface disturbance beyond previously

inventoried limits, or the development of any new site, would require resource inventories, site-specific NEPA analyses, and development and reclamation plans.

It is expected that up to four depleted quarries would be reclaimed in conjunction with timber sales during the life of the plan. After all useable material is removed, reclamation work would be conducted according to an approved interdisciplinary plan.

Projected Decorative Stone Site Development Scenario (Common to All Alternatives)

It is anticipated that the Lakeview District Office would receive one or two sale requests per year for decorative stone. In most cases, existing roads would provide access to areas where the stone is scattered on the surface. In these areas, the rock would be hand-picked and loaded directly onto pickup or flatbed trucks, or onto pallets and then loaded onto trucks. There would be both on- and off-road vehicle travel. There is a possibility that temporary road or trail construction could be necessary to gain access to some areas, such as the rocky area of the Gerber Block. Prior to designating an area as a decorative rock gathering area, and prior to any road or trail construction, appropriate inventories and NEPA analyses would be conducted to prevent unnecessary and undue degradation. Reclamation plans would be developed for any designated collecting areas and their access roads and trails.

Alternative Non-Mineral Energy Development Scenarios

All non-mineral energy project proposals are considered tentative or speculative and do not warrant detailed consideration in this Resource Management Plan/Environmental Impact Statement (RMP/EIS). No BLM permits, leases, agreements, or rights-of-way, would result from this plan, with the exception of the Salt Caves hydroelectric project proposal under alternatives A and B. Any potential BLM decision for areal or linear rights-of-way or non-mineral energy development would be guided by applicable laws, regulations, and procedures and include appropriate environmental analyses. Any application would first be screened for general consistency with the approved plan. Proposals that are clearly prohibited by RMP land use allocation decisions would be rejected without further consideration. Applications that could be permitted or conditionally permitted could be analyzed on a case-by-case basis. Such analysis could include potential RMP amendments, if warranted. Plan amendments would involve substantial public notice and involvement opportunities, incorporate appropriate levels of environmental analysis, and require interagency coordination.

Solar and Wind Generated Energy Development

Currently there are no proposals for wind or direct solar energy conversion sites. Bureau of Land Management lands in the planning area are not expected to provide any opportunities for wind or direct solar energy generation due to the lack of suitable wind velocity and reliability and the lack of sufficient sunny days per year.

Pumped Storage Hydroelectric Project Rights-of-Way

There are no operating pumped storage facilities in Klamath County. According to the waterpower site records maintained by the BLM Oregon State Office, since January 1987, there have been 15 preliminary permit applications made to the Federal Energy Regulatory Commission (FERC) for pumped storage projects in the Klamath Falls Resource Area (KFRA). All of the applications have been filed by two competing developers at eight different potential pumped storage sites; seven of the sites are on Bryant Mountain, with the eighth site on Stukel Mountain. Ten of the 15 preliminary applications covering six of the locations are still active. A preliminary permit to conduct feasibility studies has been issued to the Russel Canyon Corporation for the Stukel Mountain Pumped Storage Hydroelectric Project and the Lorella Pumped Storage Project.

The general arrangement of a pumped storage project includes an upper reservoir formed by one or more, usually two, embankments and a lower reservoir usually formed by one continuous embankment. The two reservoirs are connected by a power tunnel with an powerhouse located near the lower end of the power tunnel.

The size of the upper and lower reservoirs generally allow for approximately 10 hours of generation at the rated capacity of the project. This represents a storage capacity between 12,000 and 16,000 acre feet of water for a 1,000 Megawatt (MW) plant operating at maximum generating capacity. Between 500 and 1,000 acre feet of makeup water would be needed annually to replace losses incurred from seepage and evaporation. The project is a closed system with water cycling between the upper and lower reservoirs. The cycle

between empty and full would probably be every 48 hours, although cycling every 24 hours is possible. Resources found on the lands inundated by project waters would essentially be eliminated by the project, and little, if any, resource value would accrue from the artificially created wetlands due to the frequency of water fluctuation.

Pumped storage projects recycle water within a closed system to provide a source of quick start peak power and to level-out the demand on thermal units, run of river hydroelectric plants, and other sources of baseload power. During off-peak periods, when demand for electrical power is low, the reversible pump/turbines would operate in a pumping mode, pumping water from the lower reservoir to store in the upper reservoir. Energy for pumping would be provided from thermal, nuclear, or run-of-river hydroelectric plants. During periods of higher electrical demand, water would flow from the upper reservoir through the reversible pump/turbines to the lower reservoir to generate on-peak energy.

Pumped storage hydroelectric projects consume more electrical energy than they produce, operating at approximately 80 percent efficiency (for every 100 kilowatts [kWh] of pumping energy 80 kWh of peak power is produced). They could be profitable when they can be located near a suitable electrical supply/ distribution network and the peak electrical sales price sufficiently exceeds the night time purchase price.

Pumped storage projects can be environmentally benign when they are powered during the off-peak times by nuclear or gas fired plants, and they replace coal or oil fired powerplants used to meet peak demand. The benefits derived from pumped storage plants are substantially lower when off-peak power is provided by run-of-river hydroelectric plants and anadromous fish are affected as a result.

Effects resulting from the operation of the proposed project are not under the purview of the BLM, but are the responsibility of the FERC.

Salt Caves Hydroelectric Project

The potential economic benefits and the project-specific and cumulative environmental effects associated with four alternatives, including the No Action alternative, for developing the hydroelectric resource of the upper Klamath River in Southern Oregon were evaluated by the FERC in their *Final Environmental Impact Statement on the Salt Caves Hydroelectric Project* (FERC 1990) and which is incorporated by reference into this EIS. The FERC recommended the no-dam alternative for licensing because it would be the least environmentally damaging method to develop the hydroelectric resource of the Klamath River; therefore only the no-dam alternative is discussed here.

Proposed Action. The no-dam alternative would consist of a diversion facility at the tailrace of the existing J.C. Boyle Hydroelectric Project powerhouse (figure 4-C-1) 20,850 ft. of concrete-lined, unpressurized 21-foot-diameter tunnel in two segments; 15,300 feet of buried pipe located in two segments; 6,020 feet of open canal; a 1,900-foot-long channeled forebay leading to twin, steel 10-foot-diameter penstocks 1,630 feet long; a powerhouse containing two 48-MW turbine generator units; and a 7,500-foot-long, double circuit 230-kilovolt transmission line (figure 4-C-2).

The power conduit, would extend 9.7 miles upstream from the forebay to the tail race of the John C. Boyle Hydroelectric powerhouse, and would be located at an elevation of approximately 3330.0 feet. The powerhouse would be located at river mile (RM) 209.9 near the Oregon-California border.

An existing unimproved road would be upgraded from the J.C. Boyle powerhouse downstream to the vicinity of the proposed Salt Caves powerhouse to serve as the project's main access road. Additionally, a service road would be constructed adjacent to the power canal and forebay for use solely by plant personnel.

Various features would be included in the no-dam alternative to mitigate adverse effects on fish, wildlife, and recreation. These include wildlife crossings and escapes along the power canal and a side overflow concrete weir at the diversion facility capable of releasing flows for whitewater rafting (figure 4-C-1).

To reduce visual and wildlife effects, approximately 80 percent of the 8.4-mile power conduit would consist of either tunnel or buried pipe. To facilitate wildlife crossing of the remaining 20 percent, five wildlife overpasses would be located along the exposed canal portion of the conduit. An 8-foot-high fence would extend the length of the canal and forebay to prevent wildlife entry, and escape ramps would be provided along the canal.

The other mitigative measures proposed by the applicant and supplemented by the FERC staff for the proposed project would be incorporated, where applicable, into the no-dam alternative (table 4-C-1).

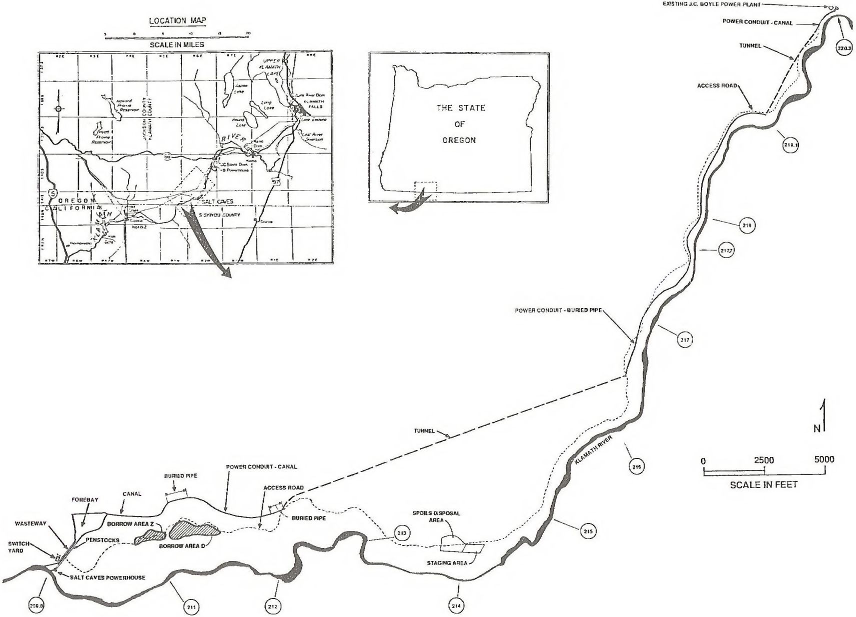

Figure 4-C-1. No-dam alternative, diversion facilities at J. C. Boyle powerhouse. (FERC 1990)

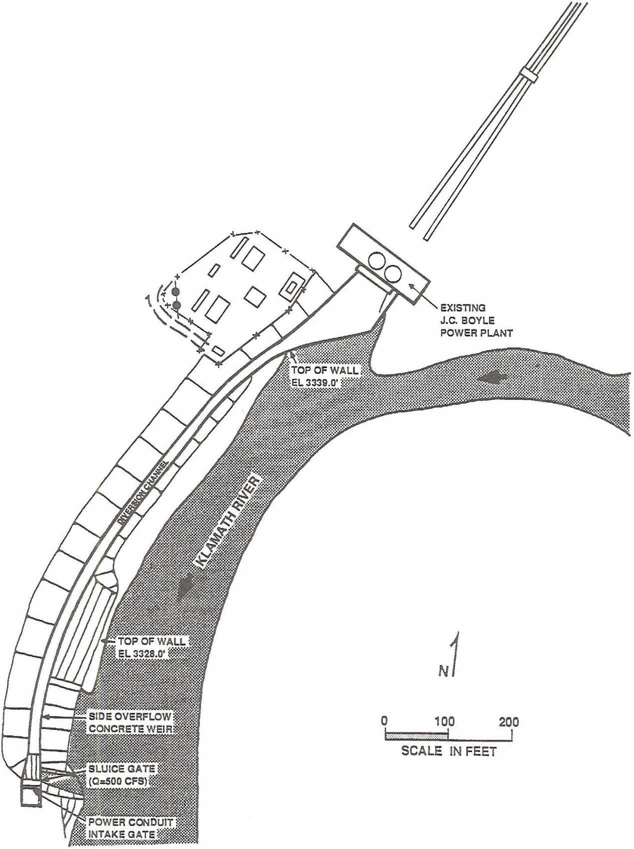

Figure 4-C-2. No-dam alternative general plan. (FERC 1990)

Table 4-C-1. Mitigative Measures for the No-Dam Alternative.

Affected Resource	Proposed Measures
Geology and Soils	Reclamation and revegetation of borrow areas, staging areas, and cut-and-fill slopes.
	Avoidance of landslide hazard areas and monitoring of potential landslide hazards with inclinometers and piezometers.
	Erosion and sediment control program.
Fish and Aquatic Habitat	Habitat improvements in Spencer Creek and the diversion reach.
	Downramping of Salt Caves powerhouse discharge flows over 5.5 hours. Ramping of rafting releases as per existing releases at the Boyle powerhouse.
	Maintenance of existing daily timing of downramping in the powerhouse reach to protect larval endangered suckers during the larval drift period in spring.
	Monitoring of fish attraction to the powerhouse tailrace and provisions to alleviate potential injury to the fish or migration delays associated with the attraction.
	Fish population and mitigation effectiveness monitoring program.
	Construction of the powerhouse cofferdam during the low-flow summer period to minimize sediment input to the river.
	Financial support of the endangered sucker restoration efforts of the Interagency Klamath Basin Suckers Working Group.
	Winter-spring flushing flows of 1,500 cubic feet per second (cfs) during dry years, released at J.C. Boyle powerhouse over a period of several days.
Wildlife and Botanical Resources	Wildlife habitat management of 2,066 acres, including fencing to exclude livestock, and vegetation manipulation on 495 acres. Creation of 18 wetlands (1/3 acre each) along canal. Enhancement of five wetlands at existing seeps using check dams.
	Burial and tunneling of 36,150 feet of power conduit.
	Deer fencing (8 feet high), escape ramps (3), and 100-foot-wide wildlife overpasses (4) along the 6,020 feet of open canal and along the forebay.
	Three wildlife crossings over penstock and wasteway.
	Construction disturbance avoidance plan to minimize disturbance to nesting raptors and wintering deer by restricting construction timing and location.
	Camping and ORV use restrictions in specific areas along the river with signs of excessive soil compaction and vegetation disturbance from these activities.
	Closing of access roads into the lower reach of the canyon (especially south-facing slopes) by gating in winter to minimize disturbances to wintering deer.
	Provision of nest platforms for osprey.
	Design of transmission lines to avoid raptor electrocution.
	Construction crew education program to minimize wildlife disturbance and encourage compliance with speeding restrictions on access roads.
	Wildlife monitoring program and contingency plan including raptor nest site surveys, winter raptor surveys, and raptor nest monitoring.
	Deletion of the applicant's proposed powerhouse bridge.

Table 4-C-1. Mitigative Measures for the No-Dam Alternative (cont.)

Affected Resource	Proposed Measures
	Preconstruction site-specific reclamation and revegetation plan, including monitoring and contingency plans.
	Fire prevention and control plan to minimize risk to wildlife during construction and operation.
Land Use	Range improvement measures on the Edge Creek allotment.
Recreation	Scheduled whitewater rafting release flows on 32 days for 6 hours per day at 1,500 cfs. Releases between June 15 and the end of the third week in August to lessen effects to juvenile trout. Release scheduling to be done in consultation with the BLM. Public notification of the schedule.
	Improvement of existing roads in the project area and construction of new roads to provide better access for recreationists.
	Provision for construction of four new, primitive recreation areas, including an unsurfaced foot trail for fishing access.
	Recreation facilities to be installed on a schedule developed in consultation with the BLM on the basis of an applicant-sponsored recreation use monitoring program.
	Off-site improvements to the county-operated Sportsman Park.
	Several asphalt pads to provide fishing and viewing access for the handicapped.
Visual Resources	Recontouring of cut and fill slopes and borrow areas to natural-appearing and stable slopes.
	Development of blasting schemes that result in natural-appearing rock formations and enhance revegetation opportunities.
	Setting back clearing, grading, and construction activities at borrow areas, conduit fill slopes, and recreation facilities 100 feet from the shoreline.
	Development of vegetation planting and management specifications for roadsides, transmission line rights-of-way (ROWs), conduit ROWs, and all facilities.
	Feathering of transmission line ROW clearings, and use of wood poles and nonreflective equipment, structures, and hardware.
	Protection of horizon line by setting back from rim borrow area D, recreation parking areas C and D, and construction activities where possible.
	Diminishing visual contrast of specific project features using dark, recessive matte tints or paints and concrete forms with rough textures and shadow patterns that match surrounding dominant landscape.
	Siting and designing tunnel portals to reduce visual contrast with the surrounding landscape.
	Use of topographic features to help screen the switchyard and substation from the river and roads.
	Siting and designing of wildlife and livestock fencing to be unobtrusive along the river and roads.
	Re-contouring and revegetation of tunnel spoils.

Table 4-C-1. Mitigative Measures for the No-Dam Alternative (cont.)

Affected Resource	Proposed Measures
	Burial of approximately 30 percent of the penstock and painting of the above-ground sections with dark, recessive matte colors.
	Provision of only safety and emergency outdoor lighting to protect nighttime darkness.
	Partial protection of the visual quality of the sightseeing and rafting experience by burying and tunneling 80 percent of the power conduit.
Socioeconomics	Monitoring construction employment on a monthly basis and advising any affected agencies of potential growth problems.
	Requiring construction contractors to hire local labor when possible and instituting on-the-job training when practicable to maximize the level of local employment.
	Maintaining and upgrading the J.C. Boyle access road section affected by construction and developing maintaining all project access roads to meet county roadway improvement standards.
Cultural/Historical Resources	Scientific excavation to recover data at the Border Village site (KLA-16).
	Execution of site location confidentiality agreements with construction supervisory personnel to protect sites from vandalism.
	Continued monitoring of prehistoric sites by the BLM and project maintenance personnel to determine whether indirect effects are occurring.
	Location of recreation area A 1,500 feet upstream to avoid direct and indirect effects on prehistoric archaeological sites Kla-20, -21, and -554.
	Location of boat launch area upstream to avoid indirect effects on prehistoric archaeological site Kla-21.
	Temporary fencing only for archaeological sites within 500 feet of construction areas to avoid revealing the site locations. Monitoring during construction for sites located within 500 feet of construction areas.

[1]Source: the Federal Energy Regulatory Commission.

Operation. Since the no-dam alternative diversion facilities would only be capable of using tailrace discharges emanating from the J.C. Boyle powerhouse, the no-dam alternative's power generation would be completely dependent upon the volume and duration of discharges from the upstream project. The Salt Caves no-dam alternative would have to mimic the generating mode of the J.C. Boyle Project.

With the exception of occasional releases for rafting, no water would be released into the river at the diversion site to supplement the existing instream flows (ranging from about 350 to 400 cfs). The no-dam alternative would annually generate an average of 432 gigawatt hours. The 17 percent increase in generation over the applicant's proposal is due to the gain in head associated with moving the diversion site upstream to the J.C. Boyle powerhouse.

A total of 1,500 cfs would be provided to facilitate whitewater boating for 6 hours per day for 32 days from mid-June through mid-August. The whitewater releases would be made at the diversion intake, immediately downstream of the J.C. Boyle powerhouse.

Construction Plan and Schedule. The main construction yard and staging area would be located on the right side of the river near RM 214.3 (figure 4-C-2). With the elimination of the dam, material requirements would be greatly reduced, thereby eliminating the need for the principal borrow sites, areas J and L.

For the purposes of earthwork during construction, the project would be divided into two sections. The upstream portion of the project would include all facilities upstream of the inlet portal of the long tunnel. Earthwork in the upstream portion would result in approximately 1.2 million cubic yards of excess excavation, which would be placed in a spoils disposal area of about 21 acres immediately adjacent to the staging area (figure 4-C-2).

The downstream portion of the project begins with the long tunnel and includes all facilities downstream. Cuts and fills for the downstream portion would be balanced, with the forebay embankments absorbing the majority of materials excavated. Impervious material for the core of the embankments and for the forebay lining would be excavated from borrow area D while area Z would serve as an additional materials source (figure 4-C-2).

The no-dam alternative would be constructed over a 33-month period.

Work Force Requirements. The construction work force for the no-dam alternative would peak at about 540 workers, with total construction effort estimated at 1,218,000 manhours.

Employment associated with ongoing operation and routine maintenance would be limited to one or two workers.

Safety Controls. Security features would be provided as protection from vandalism and also to protect the public and wildlife from high voltage electrical equipment. The powerhouse top deck would be constructed of reinforced concrete, and backfilled flush with the ground. Equipment access hatches would be of concrete or steel to prevent removal without proper equipment. Personnel access would be by means of a padlocked Bilco-type bulkhead in the deck. The substation beside the powerhouse and the switchyard would be fenced with padlocked entry gates. The powerhouse access roads from both the south and north and the power conduit maintenance road would be fenced and gated where they intersect public access roads. All operating and control equipment for such items as gates and measuring equipment would be provided with appropriate protective housings. The fish screenhouse would be enclosed with locked access doors.

A diesel-driven generator would be provided in the powerplant to supply station service power under emergency conditions. In operating the proposed rafting release chute, a system would be provided to warn any fishermen prior to beginning the release. The release would be increased gradually from zero to the maximum and then decreased gradually.

Environmental Effects of the Salt Caves Project

The discussion of environmental effects is extracted from the FERC's Final EIS on the Salt Caves Project and is intended to provide a representative sample of the environmental effects of the Salt Caves project. Refer to FERC/EIS for a more complete description of effects and mitigating measures.

The primary effects on geology and soils would be increased short- and long-term erosion and sedimentation from surface-disturbing activities, along with potential hazards of natural mass-wasting processes in portions of the project area.

Construction of the power conduit would result in 21,650 feet of cut and fill slopes. Although the steepest section below the J. C. Boyle powerhouse would be tunneled, the remaining upriver segment would result in nearly continuous cut slopes and localized large fills roughly at RM 216.5 and RM 219.0. Disposal of 1.2 million cubic yards of excess excavation material in a 21-acre spoil disposal area adjacent to the staging area would occur. The buried pipeline would cross six talus slopes of considerable size at RM 213.2, RM 215.4, RM 216.0, RM 212.8, RM 214.6, RM 219.0, and RM 217.8. Relocation of the canal and forebay upslope would result in its intersecting portions of several rotational-slide blocks. None of the landslides are moving at present, but the possibility exists for remobilization through undercutting the landslide. The power conduit would be susceptible to effects if landslides, rockfalls, or debris flows were to occur. The 19-acre earthlined forebay would be more prone (depending upon lining material used) to water seepage into the underlying rock, thereby potentially reducing slope stability in the immediate area. Sediment input to the river from road construction and use during rainfall events would be high even with mitigative measures. Construction of borrow areas D, Z, and T would create high erosion rates in the borrow areas

due too increased runoff volumes and redirected and concentrated flows. Proposed mitigation measures would be less effective if expected revegetation does not occur. Very slow revegetation of cuts along the existing road, accompanied by sloughing, indicate that the expected revegetation rate may not be attained.

The no-dam alternative would modify the existing flow regime of the Klamath River by diverting, up to 2,400 cfs of J.C. Boyle powerhouse discharges at RM 220 and returning the water to the river at RM 210. The remaining flow of 350 to 400 cfs in the diversion reach would be made up of the required 100 cfs minimum instream flow from the J. C. Boyle dam and 250 to 300 cfs of high quality spring water entering the diversion reach. Maximum water temperature would be reduced relative to existing conditions in the project reach between the J.C. Boyle and Salt Caves powerhouse. Between the Salt Caves powerhouse and Copco reservoir, the water temperature regime would be similar to existing conditions (the State of Oregon and the FERC staff disagree on water temperature effects). Refer to the FERC EIS for more detail.

Benthic algae and macrophyte production in the diversion reach would increase over existing conditions due to stabilized lower flows, lower velocity, and high solar radiation (shallower, clearer water); however, total production would not reach levels sufficient to suppress dissolved oxygen below the state standard of 7 miligrams per liter during the summer. Lower levels of nutrients (especially phosphorous), lower water temperatures, winter spillage at Boyle Dam, and summer rafting releases would ensure against development of a high biomass of plants in the diversion reach.

Dissolved oxygen levels are not expected to decline below existing levels in the diversion reach under the no-dam alternative.

In the power house reach dissolved oxygen levels would be similar to existing and proposed project conditions, with the exception that the shift in peak water temperatures from night to daylight hours would increase nighttime (minimum) dissolved oxygen concentrations.

The upper Klamath River fishery resources, particularly the wild rainbow trout population in the project reach, would benefit from the no-dam alternative compared to existing or proposed project conditions.

Suspended sediment would be input to the river during construction and would potentially reduce the survival of rainbow trout and endangered sucker eggs spawned in the diversion and powerhouse reaches.

In the long term, the no-dam alternative would result in improved growth, survival, and recruitment of the rainbow trout population in the project reach over existing or proposed project conditions because of improvements to habitat and reductions in standing of trout fry and juveniles.

Overall, the shortnose and Lost River suckers would be minimally affected by the proposed no-dam alternative. The transfer of the release of J. C. Boyle Reservoir water from the J. C. Boyle Powerhouse to the Salt Caves powerhouse would not change existing adverse conditions in the sucker spawning area above Copco Reservoir. Ramping rates below the Salt Caves powerhouse would be unchanged; however, the change in the time of occurrence could increase the degree of fry standing.

Enhancement to the habitat in the Salt Caves diversion reach under the no-dam alternative could increase the amount of spawning habitat for Copco Reservoir suckers. Gravel introduction to the diversion reach would also increase sucker spawning habitat. Stable flows in the diversion reach would benefit sucker egg and fry survival.

Although the potential standing of sucker eggs and fry in the diversion reach would be reduced from existing conditions, standing would remain a problem in the major spawning areas above Copco Reservoir. While there is the potential of stabilizing flows below the Salt Caves powerhouse during the spring under the applicant's proposal using water stored in the proposed Salt Caves reservoir, this would not be possible under the no-dam alternative without a change in the operating regime of the J. C. Boyle Project.

Approximately 88 vegetated acres would be permanently lost due to replacement by above-ground project features. Vegetation removal would occur on approximately 148 additional acres that would be revegetated following construction.

A permanent acreage in the 5,675 acre no-dam alternative project area loss would include about 3 percent of the meadow community type, 4 percent of the oak/shrub type, 2 percent of the mixed conifer type, and lesser percentages of the other types. The 148 acres lost temporarily during construction would include 5 percent of the meadow type, 5 percent of the pine/oak forest type, and 5 percent of the pine/juniper type within the terrestrial study area. Although revegetation would occur following construction on this latter area, conifer forests would require longer than the 50-year license period in most cases to regain their current stage of development. The combined long-term

loss of conifer forest types within the terrestrial study area would be about 3 percent for mixed conifer type and 6 percent for pine/oak type.

The total area of wildlife habitat lost or modified by the no-dam alternative would be about 237 acres. This includes about 88 acres that would be permanently lost. About 148 acres would be cleared and revegetated following construction.

The applicant proposes a habitat management program for 2,066 acres adjacent to the project as mitigation.

Construction of the no-dam alternative would not result in the direct elimination of any known raptor nest sites, except for the possible elimination of an American kestrel nest site located near the proposed diversion structure.

Habitat effects on forest raptors would occur from effects on 140 acres of forested habitat; however, this loss would not be mitigated during the license period because of the long recovery time for forested habitats.

Construction of the no-dam alternative would eliminate or modify 58 acres within bald eagle nesting territory. This represents 2 percent of the 2,740-acre territory. The long-term loss of 16 acres represents less than 1 percent of the territory area. No riverine or riparian habitat would be lost as a result of project development. The long-term loss of 16 acres would occur as a result of road and recreation facility development and in nonreclaimable fill areas.

Stabilized flows in the diversion reach are expected to improve foraging conditions for bald eagles.

Construction timing would reduce the potential for construction disturbance effects to a low level. Refer to the FERC EIS for more information.

Habitat effects on peregrine falcons would not occur if peregrines do not use the project area for nesting or wintering. If historic nest sites are re-occupied in the future, habitat effects would not be significant. Refer to the FERC EIS for more information.

One osprey nest site could be unusable for one to three nesting seasons due to construction disturbance. Increased recreational use associated with improved access to the west side of the river and operational and maintenance activities could adversely affect one osprey and one prairie falcon nest site and generally increase the level of wildlife disturbance on the west side of the river.

Surface-disturbing activities associated with construction of the Salt Caves penstock and powerhouse and recreation area E would adversely affect Kla-16, a prehistoric archaeological site that has been determined eligible for nomination to the National Register of Historic Places. Excavation for powerhouse foundations and wasteway would directly affect much of this site.

The applicant proposes to mitigate these adverse effects by completing a program of scientific excavation to recover data. Native Americans of the Shasta Nation have agreed to participate in the data recovery effort, as long as human burials and the artifacts accompanying the burials are handled in accordance with the tribe's wishes.

The no-dam alternative conduit would be located in proximity to several prehistoric archaeological sites including Kla-25, -628, -788, -790, and the forebay site. The FERC staff concludes that effects on these sites during construction could be avoided by fencing or flagging the sites, instructing construction personnel to avoid them, and monitoring construction in their vicinity.

The no-dam alternative would have minor effects on land uses, including grazing, recreation uses, and potential future timber management. The no-dam alternative would also affect the suitability of the Klamath River Canyon for potential ACEC designations. Licensing of the no-day alternative would preclude future designation of the upper Klamath as a Wild and Scenic River.

Recreation uses would be both positive and negatively affected by the no-dam alternative. The no-dam alternative would reduce the values of the river that make it potentially eligible for ACEC and Wild and Scenic River designations. This would be primarily attributable to the great reduction in flows in the diversion reach and the presence of man-made structures. The reduction in flows would benefit angling, but would reduce the value to whitewater boaters and other shoreline users, such as picnickers, campers, and wildlife observers. These reductions in value would affect the overall suitability of the river for ACEC designation and eligibility for Wild and Scenic River designation. The no-dam alternative would not reduce the river's suitability and eligibility as much as would the applicant's proposal, regardless of staff-recommended mitigation.

Under the no-dam alternative, whitewater boating would be moderately adversely affected. A rafting release flow would be provided at the diversion facility discharge weir located about 950 feet downstream of the J. C. Boyle powerhouse. With 32 days of scheduled, predictable releases at this location, rafters could experience the same river conditions (length, flows,

and use patterns) as they do under existing conditions. The major difference between the no-dam alternative and existing conditions would be the reduction in number of raftable days from June through September from approximately 87 days to 32.

The no-dam alterative would result in an improvement in the wild trout population compared to existing conditions and would thus enhance angling use. While improved access would provide an amount of increased angling opportunity similar to the applicant's proposal, the overall effect of an enhanced fishery would result in a higher angler success rate and overall higher-quality angling experience. Rafting releases in early and mid-summer would reduce some of the angling benefits of the no-dam alternative; however, a substantial improvement would occur over existing conditions.

The no-dam alternative would bury or tunnel approximately 80 percent of the power conduit system. The tunnel from RM 220.0 to RM 219.1 and from RM 216.7 to RM 212.0 would not be visible from the river or access roads. The tunnel portals would be designed to reduce visual contrast with the surrounding landscape.

In the short term, the buried conduit route would be highly visible from RM 219.2 to 216.7 from the river and road due to the extensive cut and fill slope disturbance. The route would have low to moderate adverse aesthetic effects in the long term, provided the new fill slopes and cut banks remain stable and the revegetation of indigenous plants is successful. The buried conduit, totaling 15,300 feet in length, would require greater cutting and filing than the above-ground canal. The bench created on top of the buried conduit would permanently contrast with adjacent natural landforms and vegetation. In most locations, views from the road to the river would be across the buried conduit's bench and fill slope.

The above-ground power conduit beginning at RM 212 would not be visible from the river but would be partially visible in the foreground from the nearby road and partially visible in the middle ground from the historic Topsy Grade. With the staff's recommended mitigation measures, including color and texture mitigation of the conduit surfaces, protection of roadside vegetation buffers, and successful establishment of indigenous vegetation in disturbed areas, the above-ground conduit would moderately affect canyon aesthetics.

Construction employment for the no-dam alternative would peak at 539 workers. Of this peak work force, 40 percent, or 220 workers, would be hired nonlocally. The population increase associated with this employment level would result in slightly less than a 1 percent increase, or 395 persons.

Construction wages and local expenditures could be as high as $37.5 million, or $12.5 million annually. Approximately 1/3 of the wages and expenditures would be taxes paid to the federal government and to the State of Oregon. Benefits from these dollars would not accrue locally.

Housing and public services would be relatively unaffected under this alternative, and income tax revenues to the state would remain at about $1 million. Peak work force traffic demands on U.S. Highways 97 and Oregon Highway 66 would increase by 360 vehicles per day going to and from the site, which is not considered significant given directional considerations.

During operation, the net revenues under this alternative could be as high as $6.8 million annually until all debt is retired and $29.8 million thereafter. Revenue would be approximately equal to that associated with the applicant's proposal. The property tax offset would represent a tax savings of approximately 12 percent to city residents.

Whitewater boating use under this alternative could reasonably reach existing levels of 3,000 users, which would mean no loss in income to the commercial guide services.

Appendix 4-D Soil Compaction, Erosion, and Nutrient Status

Introduction

Soil disturbance usually is an unavoidable consequence of most management activities. The Klamath Falls Resource Area's soils differ in their degree of sensitivity to disturbances. The type and magnitude of disturbance determines the effects on soil productivity. Timber management practices, including road construction, and livestock grazing are the dominant management activities that create disturbances (compaction/displacement, erosion, and loss of organic material and nutrition).

Both soil and non-soil factors influence soil productivity. Non-soil factors, such as geology, are not influenced by forest management activities. Soil factors which can be modified by management activities include: structure; density; organic matter content and distribution; the amount, distribution, and continuity of pore space; soil moisture and temperature; the effective soil volume for root development and water, heat, and gas storage; nutrient content; and microbial activity. Soils in the Klamath Falls Resource Area differ in their degree of sensitivity to disturbances. Determining the suitability of specific soils for management practices is an important first step in preventing or minimizing soil-related adverse effects.

Organic matter within the soil is an important source of nutrients for vegetation. Soil microbial populations slowly decompose the organic matter, releasing nutrients. The cation exchange capacity of organic matter helps hold nutrients within the rooting zone of plants. Organic matter acts as a mulch to retain soil moisture and is the key to maintaining good soil structure. The mulching effect of organic matter also reduces surface erosion by lessening the effect of raindrops, which tend to dislodge soil particles.

Soil texture (the relative proportions of sand, silt, and clay) determine certain soil characteristics. Management activities have no effect of texture, but they can affect the structure. Soil conditions and characteristics, such as water availability and movement, heat transfer, aeration, bulk density (weight per unit volume), and porosity, are influenced by structure.

Soil porosity, which is a function of pore size and distribution, influences soil-water relationships, aeration, and mechanical resistance to root penetration. Soil depth influences water holding capacity, rooting depth, and plant anchorage.

Soil organisms affect forest-site productivity through capture and uptake of nutrients, nitrogen fixation, protection against pathogens, maintenance of soil structure, and buffering against moisture stress (Perry et al. 1989). Certain forest practices, such as burning, can reduce or eliminate beneficial soil organisms.

Compaction and Displacement

Soil compaction is the process where soil pore space is reduced because of physical pressure and vibration exerted on the soil surface. Compaction results in reduced plant growth due to reduced water infiltration, and gaseous and nutrient exchange rates. Physical resistance to root growth can occur with high soil densities. Compaction may also affect populations of soil organisms, but the resultant tree growth impact is unknown.

Soil displacement is a process when a portion or all of the surface soil is moved by mechanical action. This may affect plant growth, depending on distance moved, by removing nutrients and soil organisms and by reducing available water and rooting depth.

Timber harvest and site preparation methods together with the soil conditions during operation influence the degree of soil compaction and displacement. The yarding system used during timber harvest affects the amount of soil disturbed. The amount of compaction and displacement created by ground-based yarding primarily depends on the areal extent of yarding trails, soil moisture during yarding, the number of passes over each trail, and mitigation methods used. The more a log is suspended during yarding with a cable system, the less the soils are disturbed; thus, skyline systems generally disrupt less than highlead systems (Dyrness 1967).

The areal extent of detrimental soil compaction and displacement created by ground-based yarding can be minimized by using designated skid trails that are restricted to a predetermined percentage of the harvest unit (Froehlich et al. 1981, Garland 1982, BLM Compaction Guidelines 1983). Detrimental soil compaction created by mechanical site preparation can be minimized or avoided by using a tracked backhoe/excavator and/or limiting the number of passes to two (forward and back) when soils are dry and most resistant to compaction. Tillage can fracture and improve compacted soil. The degree of fracturing varies with tillage equipment, machine operation, and soil and site conditions (such as texture, moisture, and coarse fragmented content) Andrus and Froehlich (1983) reported fracturing of approximately 80 percent for properly designed winged rippers. Davis (1990) reported bulk densities of compacted areas tilled with a self-drafting winged subsoiler were not significantly different than those in uncompacted areas. Although soil structure and pores are not returned to their natural condition by tillage, it is commonly accepted that tillage increases the productivity of compacted soils. No research has been conducted that correlates the degree of fracturing and restoration of soil density with a similar degree of growth potential restoration.

Some literature reports that data for growth effects created by detrimental soil compaction and displacement are a combined effect and the growth effects are inseparable. Soil compaction reduces porosity, thereby decreasing soil aeration and water infiltration. The amount of soils compaction and displacement and tree growth losses created by mechanical site preparation vary with differing conditions (for example, the amount of material to be piled, soil moisture, machine type and operation, depth of organic matter layers, and number of machine passes). Detrimental soil compaction is assumed to occur at depths greater than two inches and is evidenced by an increase in soil density of more than 15 percent (the standard in U.S. Forest Service manual supplement 45, section 2520.4) over the undisturbed level. Soil compaction can occur on all soils. The major increase in density occurs after the first machine pass when soils are wet and after the first three to five passes when soils are relatively dry (Froehlich and McNabb 1983, Steinbrenner 1955). Power (1987) and Dyrness (1965) reported that detrimental soil compaction and displacement created by ground-based yarding covered 25 percent of a harvest unit. Wert and Thomas (1981) reported Douglas fir growth losses 32 years after harvest on 43 percent of ground-based yarding skid trails and immediately adjacent (within 3 meters) areas. Vanderheyden (1980) found no apparent compaction recovery after 38 years on a variety of soil textures in the western Cascades of Oregon. Dyrness (1967) and Ruth (1967) reported soil disturbance created by highlead and skyline cable yarding, however tree growth effects from cable yarding are as yet inconclusive.

Soil Erosion and Mass Wasting (Landsliding)

Surface and mass wasting are two types of soil erosion that affect long term productivity of forest soils. Both are naturally occurring geologic processes involving gravity, soil water, and precipitation events.

Surface soil erosion, which includes sheet, rill, gully, and dry ravelling, is the detachment and downslope movement of individual soil particles or aggregates. It is caused either by the energy of rainfall and running water acting on bare soils, or by surface disturbance on steep slopes. Freezing and thawing, especially on a daily basis, can cause considerable erosion on disturbed ground. This is particularly apparent in road cutbanks and areas with exposed soil.

Mass wasting (landsliding) is the downslope movement of soil and rock material. The volume of mass wasting events can range from a few cubic feet to thousands of cubic yards. Some of the more important factors that contribute to soil and slope instability are steep gradient, low soil strength, declining root strength, shallow soil depth, road construction, and a high frequency, duration, and intensity of precipitation.

Several distinct types of mass movement are recognized. Debris avalanches and debris torrents are similar in that both occur on steep slopes, are fast moving, and are composed of soil, rock, water, and organic material. Torrents are water charged and occur in drainages, whereas avalanches lack the high water content and may or may not occur in drainages. These are the most dangerous types of landsliding and usually produce the most dramatic on- and off-site effects. Various slow moving types of mass movement, such as shallow earth flows, rotational slumps, and deep-seated geologic events, occur and are usually initiated by excessive water. Major concerns and effects of mass wasting are public safety, private property, roads, bridges, water quality, and fisheries.

Reduction in root strength following timber harvest and site preparation activities is possibly a significant cause of landsliding outside the area of road construction. These changes match the high frequency of landslides seen the first few years after timber harvest on slopes in western Oregon with high potential for failure (Burroughs and Thomas 1977). The areas most

sensitive to a loss of root strength and subsequent translational-type landsliding (the slip surface is relatively shallow, planar, and roughly parallel to the ground surface) are usually steep (70 percent or greater) slopes in concave positions over hard bedrock in areas of high rainfall. Rotational-type landslides (the slip surface is relatively deep and circular) are less sensitive to the root strength factor but are sensitive to disturbances to soil and ground water and natural slope configuration.

Nutrient Status

Soil organic matter accumulation and cycling are related to site index. When compared to lower site indices, higher sites have more organic matter incorporated in the soil and a larger nitrogen pool; therefore, productivity is usually more resilient on higher sites. For maintenance of long-term productivity, conservation of organic matter on low sites is more important than on high sites.

Harvest and site preparation intensities and frequencies influence the amount and composition of the surface organic layer. Conservation of small materials (needles, leaves, and twigs) is important for the total nitrogen on a site because these materials have the highest concentrations of nitrogen. When compared to needles and twigs, the removal of large materials (stemwood and large branches) has less effect on nitrogen supply. However, the large materials are important for continuation of healthy symbiotic fungi populations (Maser et al. 1978).

Appendix 4-E. A Spatially Explicit Life-History Simulator for the Northern Spotted Owl

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Introduction

The probability of an organism surviving a specif ied time interval is the product of the probabilities of surviving a series of discrete risks distributed across that interval: the risks include predation, starvation, exposure to the elements, and disease. Similarly, the probability of an organism successfully reproducing is linked to the ability to find a mate, the risks to the offspring, and the metabolic constraints imposed on the adults. The fundamentals of both birth and death processes are therefore based on the environmental properties of the area in which the organism exists and to its proximity to potential mates. To survive in a heterogeneous environment, an organism preferentially inhabits habitat favorable to its survival and avoids barren or dangerous areas. The animal's movement and response to environmental heterogeneity is therefore evolved to exploit the use of available resources so as to maximize lifetime reproductive output.

Habitat dependencies for survival and reproduction are fundamental to population ecology, and yet they are seldom incorporated into population models. In traditional modeling, these relationships are largely ignored. Mating efficiency, survival to first breeding and the metabolic status of the parents are all, for example, encompassed by two parameters: the observed birth rates and prereproductive survival rates. Given just these parameter estimates all of the complexities associated with the interface between the organism and the environment are lost. If the habitat remains constant, this is an acceptable simplification. however, management activities and disturbance events alter the habitat in which the organism exists, then the interface between the organism and its environment must be modeled explicitly. In forestry, for instance, management consists primarily of vegetative manipulation resulting in habitat change. Forest management, from a wildlife standpoint, is a vegetation treatment experiment in which wildlife population levels are important dependent variables.

To project the impacts of land management activities, models must relate population demographics explicitly to the landscape in which the organism exists. Otherwise, there can be no assessment of the potential impact of a change in landscape pattern. In addition, if the pattern of manipulation leads to a fragmented system, then the spatial relationships between the various treatments must be explicit as well.

A spatially explicit model that directly links habitat variation to demographic variation is therefore essential to assess population viability. In addition, such a model allows the efficacy of various landscape patterns to be tested and provides a means to explore interactions between the distribution, amount and quality of habitat and population dynamics (Urban et al. 1988, Pulliam et al. unpublished) . In this type of model, habitat quality is defined in terms of demographic parameters. Habitat is 'suitable' for an organism if organisms that utilize that type of habitat either have high survival rates, high birth rates or both. In particular, suitable habitat can be defined as habitat in which the combination of birth and death rates allows for a stable or increasing population.

The northern spotted owl (*Strix occidentalis caurina*), is a habitat specialist that utilizes late-seral-stage forests (Thomas et al. 1990). The acreage in these timber types has declined rapidly since the late 1940's, due primarily to high levels of timber harvest (Thomas et al. 1990), and the pattern of harvest on the landscape has lead to a high degree of fragmentation in the remaining habitat. The spotted owl is a monogamous breeder, territorial, with large (>1000 ha) home ranges (Thomas et al. 1990, Appendix I), and obligate juvenile dispersal. Juvenile dispersal ability is limited; the longest published straight-line juvenile dispersal distance is 62 miles (100 km) (Thomas et al. 1990, Appendix P, Table PI) . Given obligate dispersal and uncertainties associated with mate f inding, it is likely that isolation and f ragmentation on the scale of the home range will have an impact on the ability of dispersing owls to colonize new territories and form breeding pairs.

The Model

A spatial model was created to simulate the impact of forest management on populations of the northern spotted owl. The basic premise of the model is that an

organism's survival and reproduction can be linked explicitly to its immediate habitat and that habitat's context within the larger landscape. That is, a population's rates of survival and fecundity will vary based on map configuration. In addition, the model allows for habitat areas that are unsuitable or marginally suitable for nesting. Lastly, the model assumes that each organism must search the landscape to find a mate.

The model is a single-organism simulator. Each organism is born, moves, attempts to find a mate and breed, and dies. This format allows the behavior of each individual to be simulated by following a series of probabilistic rules rather than through the abstraction of an equation set. The model is flexible, allowing for the analyses of individual characteristics as well as population dynamics. The average distance moved by individual birds before death or pairing, for example, can be output, and thus compared with data from banding or telemetry studies to determine if the simulated movement produces a path-length similar in magnitude to the observed behavior.

Model Details

Life History

The model partitions owls into classes based on age, sex, and breeding status. Because it is not possible to determine the age of adult ($\geq$ 2 years of age) owls in the field, a stage-structured modeling approach (Lefkovitch, 1965, Caswell 1989, Thomas et al. 1990: Appendix L) has been adopted. Both sexes are modeled, with birds partitioned into three stage classes: first year birds (juveniles), second year birds (sub-adults), and birds older than two years (adults). Two classes of paired birds are recognized, sub-adults and adults (Fig. 1). A sub-adult pair is defined as a pair containing at least one sub-adult bird. The age of f irst breeding is at 1 year, with one-year-old birds given a lower fecundity rate than older birds.

Males

Males are born and disperse f rom the nest site looking f or acceptable habitat to set up a territory. Determination of site suitability is a probabilistic process. As the site quality decreases, the probability that a male will decide that a site is suitable also decreases. The probability that a male becomes territorial on a site of a given quality is referred to here as the settling rate. If a suitable nest site is found, males stop moving and become territorial. Territorial males remain on this site until they die or the site becomes unsuitable for nesting. If the site becomes unsuitable, then the males become non-territorial and reinitiate search (Fig. 2).

Females

Females are born and disperse from the nest site looking for territorial males. When they find a territorial male, they obligately pair (Fig. 3). Once paired, females remain on the site until they die or the site becomes unsuitable for nesting.

Pairs

Pairs split up only when one member of the pair dies, or the site becomes unsuitable for nesting. If the female dies, the male remains territorial and stays on the site. If the male dies the female has no fidelity to the site and will initiate searching for a new mate (Fig. 4). If the site becomes unsuitable for nesting, both members search for a new site independently.

Movement from one age-class to another

As owls age, they move from juveniles to sub-adults and finally to adults. Survival probabilities are evaluated at each movement step within the annual interval and remain constant throughout the year. At the end of the year all birds still alive move to the next stage. Years start at the birth pulse.

The impact of shifting vegetation patterns on life-histories

In the model, changes in habitat quality can be made at the start of any annual cycle. If these changes result in the previously suitable occupied sites becoming less suitable, then the territorial status of the owls occupying those areas may be changed. Territorial males, whether paired or not, become nonterritorial at a rate of (I - the specified settling rate) for the land classification. If the males are paired and remain territorial, then the pair remains intact. If not, the pair breaks up into a non-territorial male and a female, and both birds begin independent search for new habitats. All owls will immediately be subject to the probabilities of survival and fecundity associated with the altered landscape.

Survival

Mortality is assumed to result from either starvation or predation, and these factors are assumed to be additive. Both factors are linked to site. Total risk is simply (I - survival probability). Survival probability is

evaluated based on habitat quality of the site currently occupied. Because risks are assumed to be constant over the course of the year, if the year is broken up into i time-steps, the risk per step f or an owl in stage j occupying habitat type k is defined as:

$$Rt = 1 - (1 - R_{jk})^{1/i}$$

where Rt is the Risk per time step and Rik is the yearly risk as defined for age class j and habitat class k. In pairs, the survival of each member is determined by their stage as well.

Movement

The map is divided into a f ixed array of grid cells, each cell representing one territory-sized unit. The grid is hexagonal to allow more realistic movement than is provided by a square grid (Pulliam et al. 1992, Lamberson and Voss, Personal communication). The rate of movement is dependent on the size of the grid cells and the number of time-steps per-year. Individual moves are restricted to adjacent cells. All of the mobile classes of owl (nonterritorial males and females) have the opportunity to move at each time-step. To ensure that certain birds or areas of the map are not given preferential access to open territories or mates, the order of movement is fully randomized at each time-step.

The model allows owls to search with 'intelligence'; that is, they may favor movement through good habitat and avoid bad habitat. Similarly, females move obligately to known territorial males and non-territorial males may be averse to crossing defended territories. This intelligent behavior is modeled by giving the owls absolute knowledge of the cell that they occupy and incomplete knowledge concerning the immediately adjacent cells. They have no knowledge concerning more distant habitat. This knowledge takes the form of a series of switches and weighing factors that condition the probability of movement (table 1).

The movement controls can be broken down into four types. The first is a simple switch. In this case, if the criteria are correct, behavior is obligate. The second is a probabilistic switch. In this case, switching is performed with a certain probability if the criteria are correct: the behavior is obligate but the knowledge is not absolute. The process of females finding mates in adjacent cells, for instance, is a probabilistic switch. The logic is to simulate events such as a female being attracted by the vocalizations of a neighboring, unmated male.

The third control type takes the f orm of weighing f actors. In this case, knowledge is assumed to be absolute, but the behavior is not obligate. Vegetation characteristics affect owl behavior by weighing the likelihood that an owl will move in a particular direction. Weighing factors work in the following manner. At each time step a dispersing owl can move into one of six adjacent cells or may remain in its current cell. The probability of movement into any cell is therefore initially 1/7. This initial probability is then multiplied by each of the weighing elements. The product of all the cell probabilities times all the weighing factors is then scaled to sum to 1.0, and a cumulative distribution is created. A uniform random deviate is generated and its position in the cumulative distribution determines which choice is taken (table 2, Fig. 6).

Lastly, the model can simulate a variety of behaviors at the map edges. Three boundary conditions can be specified: absorbing, reflecting and wrap-around.

Details of Movement Parameters

The following is a detailed description of the parameters listed in table 1.

1. Become territorial. This parameter specifies the probability that a male will choose a site having a specific habitat quality as an acceptable territory. If the male becomes territorial and is located by a female, pair formation is obligate. The model is very sensitive to this parameter because it effectively sets the carrying capacity of the landscape.

2. Aversion. A weighing parameter that determines the behavior of the owl when faced with a variety of potential habitat types in the adjacent cells. Higher quality sites therefore have a greater likelihood of being selected than lower quality sites.

3. Site fidelity. A weighing parameter that influences the owl's decision to remain in the existing cell rather than to moving into adjacent cells. This parameter is similar to aversion in intent, but aversion only has an influence if there is a choice. An owl completely surrounded by poor habitat will have no criteria by which to choose and the choice will be purely random. Setting a low site fidelity to poor habitat will, however, cause the bird to move through these areas more quickly.

4. Linear propensity. Sometimes called a straightening parameter, this weighing parameter works in the f ollowing manner: Each owl has a one-move memory; the direction that was taken in the last move will be multiplied times the directional

weighing parameter. A large value will, therefore, make the owl move in a straight line. It should be noted that if the owl's last move was to stay put, the directional parameter will tend to make it stay put. This tendency can be compensated for by shifting the values of the parameter controlling site fidelity.

5. Territorial aversion. It is assumed that non-territorial males will avoid existing territories. This weighing parameter sets the degree of aversion.

6. Female finds male.

    a. Current cell. A switch - she obligately pairs.

    b. Adjacent cell. This parameter sets the probability that the female will find a male that is territorial in an adjacent cell. It is a probabilistic switch. If the value = 0, she will never find him. If the value is 1 she will always find him.

7. Boundary condition. Boundaries are treated as consisting of cells having special properties. In the case of reflecting boundaries, an owl at the map edge will have totally unsuitable land in those directions that lead off the map. When choosing a direction to move, the bird will show total aversion to the boundary and will never enter it. This method ensures that an extra move is not necessary to explore the boundary. In the case of absorbing boundaries, birds that cross the boundary are considered to be dead. In this case, the boundary is defined in terms of the adjacent cells within the map. Wrap-around boundaries can be thought of as a proxy of an open system. A bird that exits one edge re-enters on the opposite side of the map. In this case the boundary is defined in terms of the habitats that the bird will enter on the opposite side of the map.

Choosing a time-step

In this model, the probability of moving to an adjacent cell is a function of the condition of the local landscape and the biological propensities of the organism. Because transitions can occur at each time step, the number of time-steps per-year expresses an implicit rate of movement. Choosing the number of time-steps is not a casual process. Increasing the number of timesteps increases the velocity of travel. Choosing 40 steps rather than 20, for example, will double the potential number of territories that an owl can search. The critical question of scale involves the maximum possible dispersal distance before settling or death. The maximum recorded juvenile dispersal is 62 miles (100 km) (Thomas et al. 1990). If each hexagonal cell is 1000 ha in size, the distance across the cell is 1.96 miles (3.15 km). This would suggest 32 time-steps (64 miles) as possible appropriate yearly search distance. The probability of moving 64 linear miles in 32 time steps is, however, rather unlikely. In fact, in a pure random search the probability of taking 32 steps in the same direction on a hexagonal grid is almost zero (9xlO-28). The linear propensity (see above) would need to be set so high as to overwhelm all other movement considerations. The best way to determine whether a time-step is appropriate is to run the model using the desired movement parameters and compare the mean distance to death and distance to pairing produced by the model simulations to empirical data (Thomas et al. 1990:305, Table Pl).

Fledging

Fledglings here refer to those that survive to disperse. It is assumed that there are good years and bad years for fledging. If it is a good year, then the pair produces fledglings according to a beta distribution ranging from zero to a specified maximum clutch size. There are therefore two levels at which variability can impact the number of fledglings. If the area of the beta distribution is concentrated close to the mean, then the population will pulse based on the frequency of good years. When a good year occurs, all of the pairs will produce about the mean number of fledglings. If the probability of a good year is set to 1.0, then variability in the number of fledglings will be on an individual nest basis and will be dependent on the shape of the beta distribution. The form of the beta distribution can potentially be unique for each land class and age class. Because this is a two-sex model, the sex ratio of fledglings is also adjustable.

Random number generation

Because all of the model dynamics are controlled by the generation of pseudo-random numbers, it is important to test the randomness of the generator. The random number generator utilized in the model has passed a series of standard tests (Appendix).

GIS interface

The model has a module that allows the user to generate maps for purposes of display and to analyze the effects of hypothetical landscape patterns on population dynamics. In addition, an automated link has been created between the model and vector-based Geographic Information Systems (GIS) to allow integration with actual vegetation maps. Using this

link, a hexagonal grid with size appropriate to the home range of the species being modeled is intersected with the map and the area of discrete vegetation types contained within each hexagonal grid-cell is analyzed to determine habitat quality. This allows for a rapid translation of vegetation data collected on a stand-level into habitat quality on scale of individual owl home ranges. Maps generated through the GIS interface can be modified at the home-range level using the mapping facilities included in the model. Maps created by the model can also be transformed into vector-based GIS maps. This ability to move information freely between the GIS and the model allows a dynamic interaction between land management decisions and the potential impact of those decisions on owl populations. A manager can manipulate vegetation at the stand level within a GIS and evaluate the impact of those changes on owl populations. Model output such as mean pair occupancy for each cell (output as a map), based on a large number of simulations, can then be overlaid over the stand-level map to determine which stands correlate with areas displaying either high or low occupancy rates.

Results

The model was used to project population trends from five hypothetical landscapes with an identical number of suitable sites (Fig. 6-10). Other than habitat configuration, there were no dif f erences in the initial values of any model parameters. The map boundaries were wrap-around so that the exact location of the habitat within the map frame was unimportant. The demographic parameters (Table 3) were set to yield a finite growth rate of 1.0 and were not modified by habitat quality. In these simulations only two habitat qualities were simulated: habitat suitable and habitat unsuitable for nesting. The movement parameters deviated only slightly from a random walk: birds were twice as likely to choose suitable habitat, males treated occupied habitats in a manner identical to unsuitable habitat, and birds were twice as likely to move in the same direction as to choose a different direction. These deviations from random behavior were chosen so as to improve search efficiencies on all maps. Extreme aversion to poor habitat will, for instance, be beneficial in highly grouped habitats since it will effectively confine the search to those areas that are acceptable for nesting. It is, however, detrimental in very dispersed systems since, in these systems, juveniles must cross poor habitat in order to explore the landscape. Weak selectivity will be beneficial in both systems. Strong habitat selectivity in juvenile dispersal is also not supported by dispersal studies (Gutierrez et al. 1985, Miller 1989) the literature. Similarly, a small increase in the linear propensity has the primary impact of preventing useless searching caused by doubling-back.

The effects of clustering

The model results support previous model results (Doak 1989, Thomas et al. 1990, Lamberson and Noon, unpublished) in showing that a clustered structure is both more efficient in terms of mean population level and more stable in terms of lowered extinction probabilities than is a random structure. A spatial analysis of mean pair occupancy demonstrated that the small degree of stability shown by the random system occurred in the upper left-hand portion of the map where the density of suitable territories, through random chance, was highest.

The effects of shape

The shape of reserve areas also has an important impact on their stability properties. A cluster with a low edge-to-area ratio (Fig. 8) is more stable than continuous clusters with identical area but with varying degrees of irregularity. (Fig. 9-10) The population trend for the large, highly irregular cluster (Fig. 10) is similar to the system of three small clusters (Fig. 7).

Source-sink relationships

The previous results demonstrate the impact of reserve configuration when each landscape cell is either suitable or unsuitable f or breeding and the survival rates are constant f or all sites. In actual landscapes, the habitat lies along a quality gradient, from ideal to totally unsuitable. Within this gradient, there will be source locations that, on average, produce an excess of individuals and sink locations into which some of these juveniles will settle. The choice of settling point may well be globally sub-optimal (Pulliam 1991). An organism has no means to ascertain the availability of habitat except through experience and exploration. In this model, this process is simulated by varying the settling parameter. This parameter, which only applies to males (see Fig. 2), defines the probability that a bird will settle and become territorial in the site that it currently occupies. To test the effects of a reserve design embedded in a landscape that is marginally suitable to one that exists in a completely unsuitable landscape, a small reserve system was created and simulations were performed using two rule sets (Tables 3,4). All parameters were the same except for the settling rate for areas exterior to the reserve.

The presence of marginal habitat adjacent to reserves can have a negative impact on the stability of the

reserve system (Fig. 11,12). Even though the mean population size is larger in the source-sink system, the mean occupancy of the reserve clusters is lower and the variability of the system increases with time, leading to increased risks of extinction.

Discussion

An analysis of model behavior

A great deal of the behavior of any model is dictated by its structure, and this model is no exception. It is, in essence the sequel to a series of models originating with Lande's non-spatial deterministic model (Lande 1987, 1988), followed by dynamic versions in Thomas et al. (1990) and expanded in Lamberson et al. (in press) and Lamberson and Noon (unpublished ms).

This model differs from traditional stage structured population models (Begon and Mortimer, 1981; Getz and Haight, 1989) in many ways including the modeling of both reproductive and nonreproductive life history stages. In comparing a simple stage structured model with the landscape model (compare Figs. 1 and 13) pair survival differs because, in the spatial model, both members need to survive in order for the pair to survive. The probability of a pair breaking up is theref ore one minus the square of the adult or sub-adult survival rate (Fig. 1).

Flow rates between the reproductive and non-reproductive stages depend on survival rates, but movement from the nonreproductive states into the reproductive classes is mitigated by the probability of pair formation (P(p)) (Fig. 1). As P(p) -> 0, entry into the reproductive population also -> 0, and the population will decline. As P(p) -> 1, the non-reproductive vector empties and the model collapses into the reproductive classes. P(p) is the parameter through which spatial relationships impact the life history of the organism.

P(p) is closely related to the probability of finding a suitable site. For males, a suitable site is defined by the cell's quality and occupancy status. For females, suitability is defined by the presence of a territorial male. Even though the criteria are different, the search process is similar.

In an unconstrained random walk, and allowing a fixed number of cells to be searched, the probability of searching a cell declines rapidly with distance from the point of origin (Fig. 14). If the total number of cells searched is increased, the probability of searching a cell increases slowly and asymptotically (Fig. 15). For this reason, distance dominates search probabilities (Fig. 15,16). The model is, therefore, reasonably insensitive to changes in search velocity and extremely sensitive to the spatial positions of the reproductive pairs in the landscape.

In the model, birds search with a fixed survival probability, rather than searching a fixed number of times as has been the case in other models (Lande 1987, Thomas et al. 1990, Lamberson et al. in press, Lamberson and Noon unpublished). This difference, however, is unimportant to the model dynamics: equivalent search functions can be generated using either approach (Fig. 17).

P(p) will decline if the population is high, because unoccupied sites will be scarce and will tend to lie in areas that are distant from large groups of reproductive pairs. P(p) will also decline if the population levels are low, because searching females will have difficulty finding territorial males. P(p) will decline as the population becomes more diffuse. As a result, any actions that cause the mean distance between reproductive pairs to increase will therefore always impact the finite rate of increase of the population.

Model behavior at high population levels is qualitatively similar to a logistic model. At low densities, however, the models diverge. The logistic model assumes that population response will be most robust (the ratio of birth/death will be largest) when the population is depressed. If search is explicitly modeled, there are positive benefits associated with density. When the density drops in the context of abundant habitat, territorial males may go unpaired due to the low density of females: females will not locate males and form pairs before they die. If, in addition, low population densities are associated with long distances between potential territories, as is the case when habitat is fragmented, then the ability of the males to find territories will be reduced as well. This model, and all of the models following Lande (1987) will therefore have threshold points defined by population density and degree of habitat fragmentation at which the population will collapse. Population instability has sometimes been introduced into traditional models by incorporating an 'Allee effect' (Allee 1931; Noy-Meir 1975), but the correct functional form and strength of this effect is not clear. In this model, the 'Allee eff6ctl occurs naturally as a direct result of search.

Fecundity

The population birth rate B is also affected by costs associated with search:

$$B = b * P(m) \quad (2)$$

$$P(m) + f(s,e,P(p)) \quad (3)$$

where

B is the population birth rate,
b is the measured birth rate for paired females,
P(m) is the probability that a female has a mate, and s is the adult survival rate.

P(m), represents the balance between pair break-up and pair formation. Pair break-up is a function of the adult survival rate which is based on site quality, and is assumed to be density independent (the presence or absence of adults on the same site or in adjacent sites has no impact on the parameter value) . The rate of pair formation is controlled by P(p).

If b is constant, then B will simply follow P(p). It is this decline in B that causes diffuse populations to collapse (Fig. 6) even when there are no decreases in survival probability associated with search.

Questions of scale

Fragmentation has the impact of altering phenomenon which are dependent on contagion. Contagion can have effects that are either positive or negative. The success of females searching for territorial males is positively af f ected by contagion. The negative consequences associated with disease or the spread of fire are also dependent on contagion. Fragmentation is not, therefore, negative per-se. Its consequences, good or bad, are solely dependent on the extent to which it affects various contagion-related phenomena. Contagion phenomena will always be scale dependent - and these dependencies will be rooted in the biological and physical properties of the phenomenon. Fire, for instance, can be effectively stopped by a rather narrow fire break. This fire break may have absolutely no impact on the dispersal efficiency of a large raptor, but may represent an absolute barrier to a salamander. Similarly, a disease that depends on direct transmittal could easily be controlled by producing a f ragmentation pattern that separated the members of the species in question. If, however, the disease were vectored through a prey item, then f ragmenting the system would only be an ef f ective method of disease control if it reduced the encounter rate between the predator and its infected prey.

When modeling spatial phenomenon, it is necessary to choose an explicit spatial scale at which to model. Smaller scales will need to be implicitly modeled through indices - and these indices may, themselves be scale dependent. In this model, each home-range-sized polygon is given a quality index, and this index is in turn linked to fitness values. For modeling the spotted owl, the explicit scaling is very large (1000 ha) - based on the average size of individual owl home ranges. The fragmentation of vegetation on the landscape, however, is on the order the size of timber sale units (about 10 ha). If, for example, the quality index for a home range were based on the acreage of suitable habitat within the home range, all spatial patterning below the size of the home range would be ignored by the mode 1. Any home range with 50% owl habitat will be modeled as being of equivalent quality (equal values for mortality, aversion, etc.) regardless of the pattern of the remaining habitat within the home range. If spatial patterns within the home range are thought to be important, then they must be incorporated into the home range quality index through the use of spatial statistics such as average patch size or fractal dimension. Because fragmentation is only explicitly modeled at the broadest scale, fragmentation at lower scales may have impacts both positive and negative that are not represented by model behavior.

Territories as islands

Territories can be thought of as small islands, each having a maximum of one reproducing pair. Like islands, they have spatial dimension - they occupy a certain area of the map. And, like islands, when they experience local extinction (in this case one or both members of the pair either dies or emigrates), they must be recolonized through immigration from owls outside the territory or by an existing,, non-territorial lfloaterl population within the territory.

The concept of territories as individual islands is key to the dynamics of clusters in the model. Larger reserves can be thought of as an archipelago in which all of the islands are very close to one another. Fragmenting the landscape has the effect of moving the islands further apart.

The loss of a reproducing pair is, in effect, a local extinction. The rate of recolonization of an individual territory will be dependent on the spatial arrangement of the habitats and the fecundity of the reproducing pairs; that is, how many individuals are looking for territories or mates and the likelihood they will find the site in question.

Typical yearly adult survival for spotted owl adults ranges between 0.81-0.92 (Thomas et al. 1990: 230-231). The pair survival rate (both members survive) will therefore range from 0.72 to 0.84. When the probability of search by dispersing juveniles falls below the pair survival rate, juvenile dispersal mechanisms will not be sufficient to maintain the population of pairs at their habitatbased carrying capacity. The system will

become dependent on recolonization by non-territorial adult Ifloaters, that are already on-site. As pairs are lost due to local extinction, this will increase the distance between reproductive pairs, further increasing the disparity between extinction and colonization rates. In the absence of a balance between the rates of pair loss and reestablishment, the population will unavoidably tumble towards extinction.

The role of clusters

From a modeling standpoint, a system of clusters is more stable than a diffuse system because the clusters produce regions where search efficiency is maximized. In a cluster of suitable territories, a population can recover from low levels because P(p) will remain high. That is, because all of the remaining members of the population remain close, the impacts on P(p) are minimized and the model behaves like a traditional population model, exhibiting positive growth rates when occupancy is reduced. Dispersing males have a high probability of finding habitats immediately adjacent to existing pairs. Dispersing females will more easily find the territorial males because of their adjacency. The key to successful clusters is clearly to make the clusters large enough to avoid high levels of extinction at the cluster level. In practice this means that each cluster's carrying capacity should be large enough that normal population declines driven by environmental and demographic stochasticity do not drive the population down to levels at which random extinction is likely. Looking only at demographic stochasticity, this would suggest a minimum cluster population size of approximately 20 breeding pairs (Richter-Dyn and Goel 1972).

The effect of shape

The negative impacts caused by cluster irregularity are also due to habitat search. A circular cluster of suitable habitat minimizes the distance between clusters. All other geometric forms will have reduced P(p) when compared with the a circular cluster. The impact of cluster irregularity are, in fact, probably more pronounced than is indicated by figures 8-10. In these simulations, the risks associated with crossing poor quality habitat were identical to those encountered in suitable habitat. If greater risks were encountered in the poor habitat, the effects of irregular,cluster shape of would be accentuated.

Source-sink dynamics

The increase in variance that is observed in systems containing marginal habitat for nesting (Fig. 12) is due primarily to the increased variance in adult survival rates. If nesting is restricted to the clusters, the population will equilibrate with a relatively constant proportion of the adult population within the clusters and dispersing through the matrix. Changes in the population vital rates will, therefore, be bounded by the levels of environmental and demographic stochasticity, and population variability will remain reasonably constant over time.

When breeding occurs exterior to the clusters, the population becomes more dynamic. Both the vital rates and the spatial configuration of the population will be dependent on the proportion of the population that exists exterior to the reserve structure. If a large number of the breeding pairs lie exterior to the reserve, not only will the overall survival rates decline, but the system will also become diffuse, lowering P(p). The bounds on the population growth rates will therefore be set by both the proportion of the breeding population found exterior to the reserve and the levels of environmental and demographic stochasticity. Because the model runs are begun with all of the birds within the reserve structure, variability increases over time (Fig. 12).

The decline in mean occupancy levels in the source-sink system is due to decreased interaction between clusters. Dispersing juveniles that settle exterior to the reserve would, if this option were not available, continue searching and some of them would become pairs within the clusters. This outcome suggests that a reserve design may be more stable if the boundaries between the reserve and the surrounding landscape are very distinct. Maintenance of sink areas exterior to the reserve system may lead to sub-optimal choices on the part of dispersing juveniles.

Summary

A model containing explicit links to landscape vegetation patterns was created. Its results are consistent with previous models based on search efficiency (Lande 1987, 1988, Doak 1989, Thomas et al. 1990). An analysis of the model structure demonstrates that this model form will favor clumped reserve structures over diffuse structures due to the inherent geometric properties of the search function. The model results and subsequent analysis indicate that land management policies that increase fragmentation are extremely detrimental to territorial populations because the uncertainties of successful search cause the population dynamics in reduced populations to experience reduced rates of territory recolonization. Low population levels in fragmented systems will not, therefore, exhibit the strong upward population pressure inherent in traditional density-dependent models.

Recovery will be slow and difficult and, at a specific level of fragmentation, impossible.

Negative impacts associated with fragmentation can be mitigated by clustering reserves. Clusters will display greater search efficiencies and will be more stable than a random diffuse system with equal acreage in suitable habitat.

In addition to supporting these general conclusions, this model extends the capabilities of previous models through its ability to directly model the irregular and patchy habitat configurations found in real landscapes. It also allows f or a gradient of habitat quality and ties risk and movement rules directly to that gradient. These properties allow owl demographics to be based directly on map information held in GIS systems, and allows the modeling of populations in spatially dynamic landscapes.

Model Implementation: The BLM in Oregon

Parameterizing the Model:

All of the landscapes used up to this point have been hypothetical. In order to link the model to actual landscapes, links must be made between the configuration of the landscape and its quality as owl habitat. Because the this linkage is performed through the use of a GIS database, the landscape attributes must be chosen from those available within the GIS. In order to facilitate this process, Jon Bart, chairman of the Northern Spotted owl Recovery Team, looked to the available data to determine those habitat attributes that were linked to specific demographic information. The attribute that best correlated with survival, fecundity, and nest density of owls was the amount of mature forest within a region of the map surrounding the owl nest-site. For modeling purposes we translated this into the proportion of mature forest within a home-range-sized area, a hexagonal area 1000 ha in size.

Dr. Bart drew together the available data and constructed functions for survival and fecundity and the probability of nesting based on the amount of mature forest in a home-range-sized area. These relationships were discussed at a series of meetings with a group of biologists employed by the Forest Service, Bureau of Land Management, and private industry.

our purpose was to utilize these parameters, in conjunction with projected management plans, to look at future forest conditions and to evaluate the efficacy of those plans in terms of the maintenance of owl populations. our primary purpose was comparative: we wished to evaluate and ordinally rank the management plans, not to attempt to predict the number of owls within the landscape in 100 years. There are enormous uncertainties concerning the reliability of the habitat relationships, the recovery time f or stands that are cut, and patterns of land utilization on those lands not controlled by the *BIM*. The model results should therefore be interpreted conditionally: given that the tree growth rates, habitat relationships and owl behavior patterns occur exactly as specif ied, the plans produce the following number of owls in the following locations 100 years into the future.

Because of these uncertainties, we ran the model for each management alternative using 3 sets of parameters. Each was based on Dr. Bart's original parameters (Table 5, Fig. 18), but the parameters were shifted: In the second set, the parameters associated with >60% mature forest also were true for cells with 40-60%. In the third set, these parameters were true for stands having >30% suitable habitat. All other parameters were similarly shifted (Fig. 19). This shifting, in effect, changed the evaluation of the landscape, but did not change the behavior of the owls within habitat of a specific quality. Viewing the landscape as a system of sources and sinks, in Dr. Bart's rule set only homerange areas with > 60% mature forest are considered sources. In the second rule set Home range areas with >40% mature forest are sources, and in the third set home-range areas with >30% mature forest are sources. Dr. Bart's original rule set will therefore produce the lowest number of owls. The other two model runs are less pessimistic.

Acknowledgements

This modeling was supported by the USDA Forest Service, Redwood Sciences Laboratory, Arcata, California and was carried out as part of a post-doctoral appointment. Special thanks are given to Roland Lamberson, Humboldt State University, for many hours of consultation concerning model construction, Curtis Voss, Redwood Sciences Laboratory, for coding the unit controlling map appearance (CLASS.EXE) and Barry Noon, Redwood Sciences Laboratory, who has been the driving force behind both this modeling and previous models presented in Thomas et al. (1990). Without the help and support of these individuals, and many others as well, this work could not have occurred.

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Appendix

1. Moments. The first, second and third moments for a uniform random distribution should be 1/2, 1/3, and 1/4 respectively. Typical output for n = 1,000,000 are 0.5002, 0.3335, 0.2501 respectively.

2. Uniformity. In this test random numbers are generated and cast into a series of bins, based on their value. This test was run with 100 bins and a Chi-Square test was performed against the assumption that all bins would be equal in value. Typical values for n = 1,000,000 are < 1.0; The 0.05 critical value is approximately 120.

3. Pairs. This test looks at f irst order sequential correlation. Sequential pairs of random numbers are produced and binned based on their value. Ideally, all pairs should be produced with equal frequency. In this case the pairs were binned into a 10xIO matrix. A ChiSquare test was performed against the assumption that all matrix elements are equal in value. Typical values for n = 1,000,000 were < 2.0. Again, the 0.05 critical value is approximately 120.

4. Runs. This test looks at the overall degree of sequential correlation between random numbers generated. In this test, random numbers between 0 and 1 are generated and are rounded to 0 or 1 based on their value. As these numbers are produced they are grouped into 'runs'. 00010, for instance would have a run of 3 and two runs of 1. The run lengths are collected and, after a large number of random numbers has been produced the question is asked: is the population of runs generated significantly different than would be expected based on the binomial distribution. Here again, a ChiSquare test of f it was used to test for runs <= 30 elements in length. Typical values f or n = 1, 000, 000 ranged from 15-20. The 0.05 critical value is 41.3.

5. Period. All random number generators produce pseudorandom numbers in a deterministic cycle of finite length. The period of a random number generator refers to the length of the cycle. To test for the period, the random number generator is 'seeded' with a value and then is looped to produce random deviates until the 'seed' value is reproduced. The maximum period for a generator is, therefore, determined by the number of bits set aside to hold the seed, but may be less if the generator is improperly constructed. For the generator used in the model, the number of bits = 32, and the observed period is 2^{32} = 4.3 billion. other tests can be run, but based on these results, there is no reason to assume that any non-random characteristics of the random number generator will **have** a significant effect on the model performance.

Table 1. A summary of factors that can affect an individual's movement in the model.

Factor	Based on	Sex	Form
Become Territorial	Habitat Quality/Occupancy	M	Probabilistic Switch
Aversion	Habitat Quality	M/F	Weighting
Site Fidelity	Habitat Quality	M/F	Weighting
Linear Propensity	Behavior	M/F	Weighting
Territorial Aversion	Occupancy	M	Weighting
Female Finds Male (Current Cell)	Occupancy	F	Absolute Switch
Female Finds Male (Adjacent Cell)	Occupancy	F	Probabilistic Switch
Global Boundary	—	M/F	—

Table 2. An example of the process used to determine movement in a heterogeneous landscape. If 0.448 were generated randomly, then direction 4 would be chosen. Direction 3 is never chosen.

Direction	The initial vector	Weighing factor	Scaled vector	Cumulative Probability
1	0.143	0.900	0.143	0.143
2	0.143	0.600	0.095	0.238
3	0.143	0.000	0.000	0.238
4	0.143	1.000	0.159	0.397
5	0.143	1.000	0.159	0.556
6	0.143	1.900	0.302	0.857
7	0.143	0.900	0.129	1.000

Table 3. List of the parameter values used for the simulations. Parameters were chosen to produce as optimistic an estimate of owl survival as could be supported by these data. Parameters only varied with site quality where explicitly stated.

Parameter	Value	Source
Juvenile survival	0.29	Franklin et al. 1990
Sub-adult survival	0.935	Thomas et al. iggo
Adult Survival	0.935	Thomas et al. 1990
Birth rate	0.335	Franklin et al. 1990
Aversion	1.0, 0.5[1]	
Boundary	Wrap-around	
Linear propensity	2.0	
Site fidelity	0.5	
Territorial aversion	0.5	
Female finds male	0.5	
Time-steps	40	
Runs	30	

[1]Only two habitat types were placed in the map, one representing the best habitat and the other representing the worst. This split corresponds to suitable/unsuitable designations found in past models.

Table 4. List of the parameter values used for the cells exterior to the habitat reserve (Fig. 11, 12) . Parameters within the reserve, as well as general parameters that pertain to all cells are presented in Table 3. Parameters are those calculated for measured a demographic study, Roseburg, Oregon.

Parameter	Value	Source
Juvenile survival	0.219	Thomas et al. 1990
Sub-adult survival	0.588	Thomas et al. 1990
Adult Survival	0.812	Thomas et al. 1990
Birth rate	0.310	Thomas et al. 1990

Table 5. Rule set used for simulation of BLM management alternatives. Values for sub-adult and adult survival, and probabilities of pair formation are based on values derived by Dr. John Bart.

	Land Classification (percent)				
	<20	20-30	30-40	40-60	>60
Survival					
Juvenile	0.20	0.29	0.29	0.29	0.29
Sub-adult	0.38	0.38	0.41	0.45	0.50
Adult	0.75	0.76	0.82	9.90	9.96
Fecundity					
Adult	0.00	0.34	0.34	0.34	0.34
Movement					
Nesting prob.	0.13	0.40	0.55	0.83	1.00
Aversion	0.30	0.50	0.70	0.90	1.00
λ					
Non-breeding	0.75	0.76	0.82	0.90	0.96
Breeding	0.75	0.80	0.87	0.94	1.01

LANDSCAPE MODEL

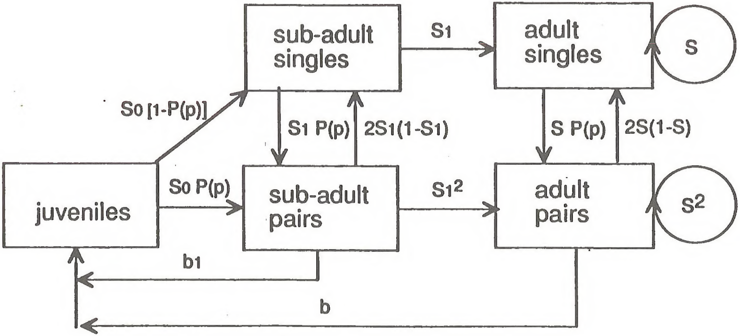


Figure 1. Flow diagram of the life history structure used in the landscape model. P(p) is the probability of pairing.

MALE MOVEMENT

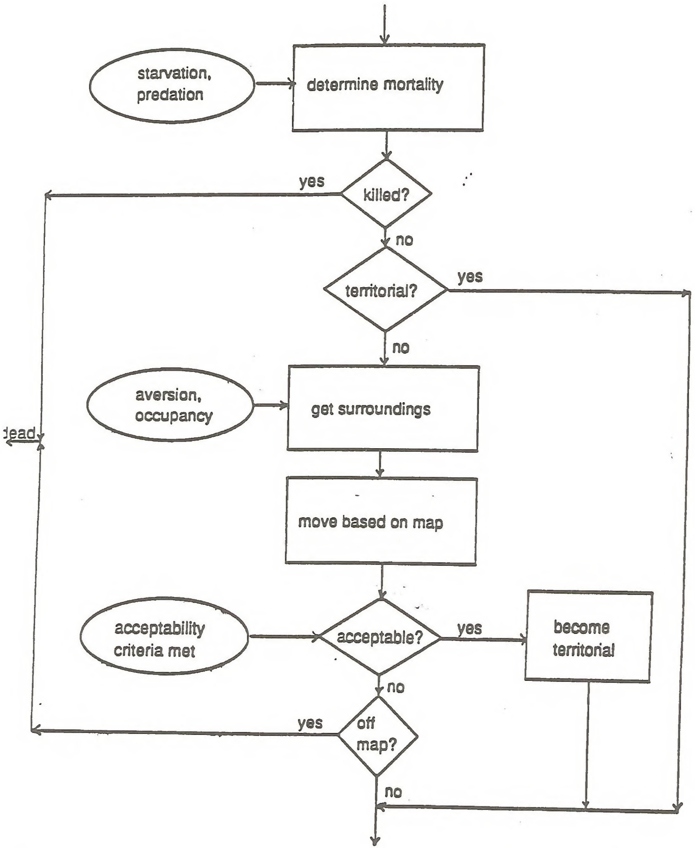


Figure 2. Flow diagram representing the process f or determining male behavior at each time step in the model.

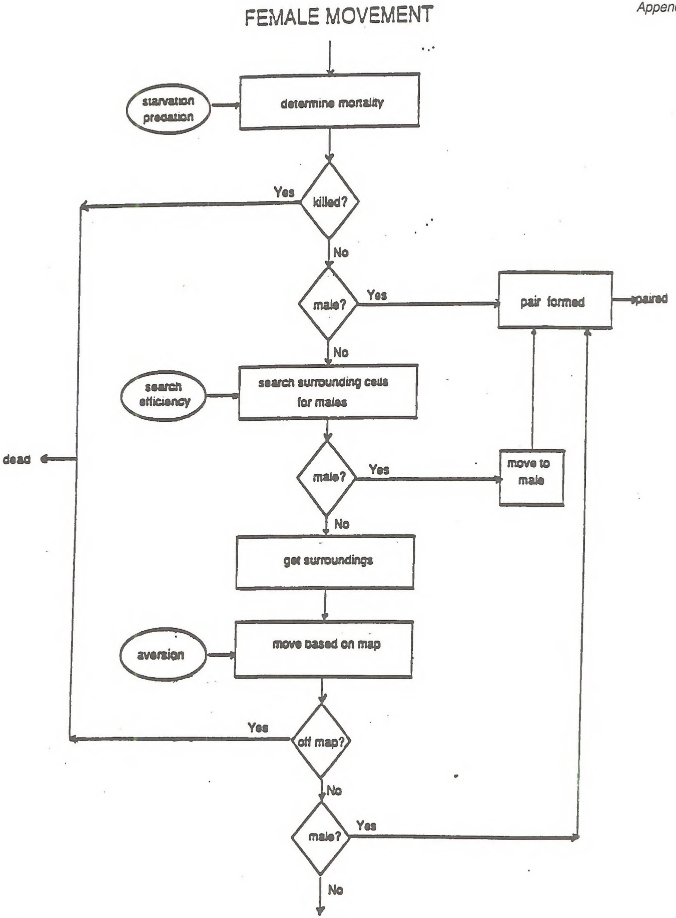


Figure 3. Flow diagram representing the process f or determining female behavior at each time step in the model.

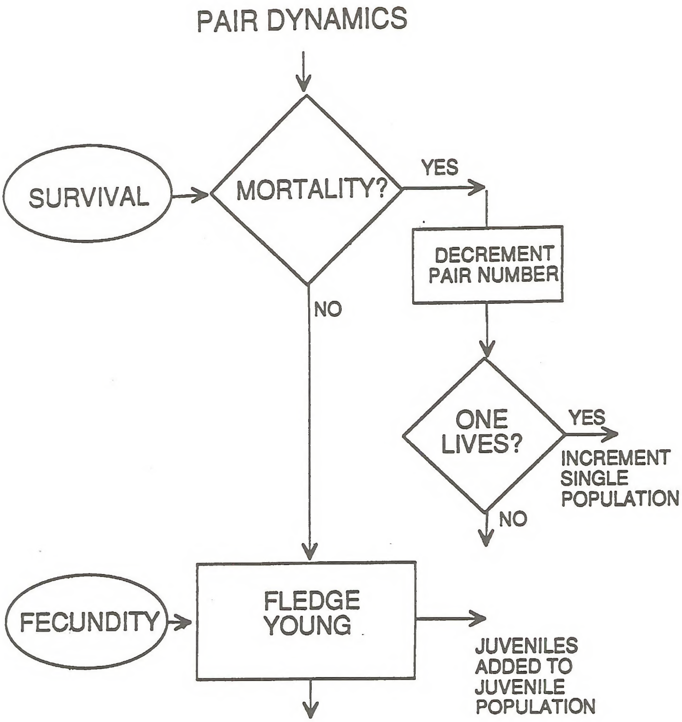


Figure 4. *Flow diagram representing yearly pair dynamics. Pairs only remain reproductive if both members survive.*

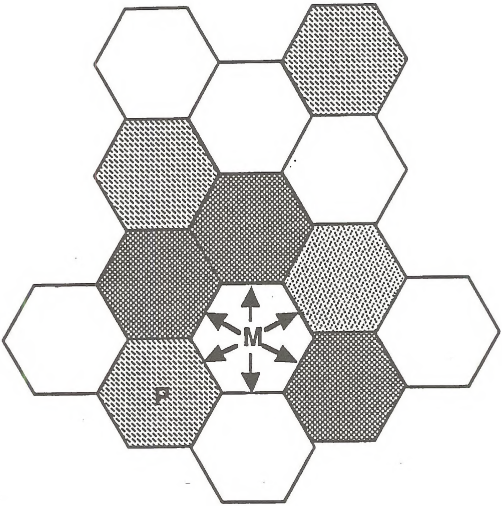


Figure 5. *The arrows represent the potential choices for a male in a heterogeneous landscape. The move will be based on a probability vector conditioned by the different qualities of the choices.*

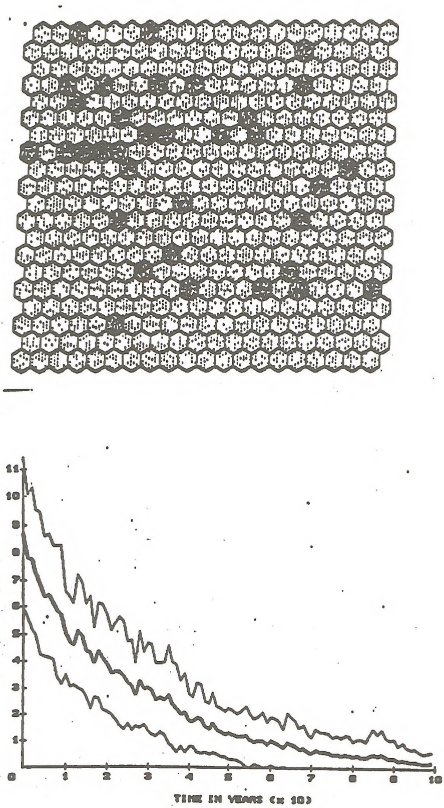


Figure 6. Model simulation showing a simulated landscape with suitable habitat randomly scattered. The results are based on 30 simulations. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.

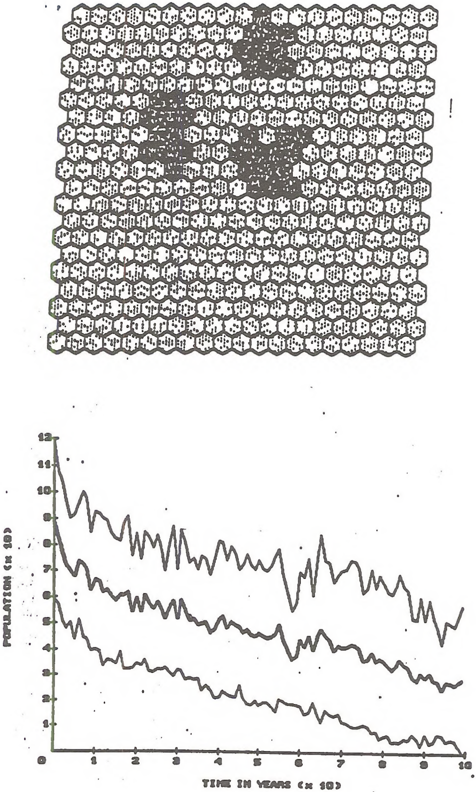


Figure 7. *Model simulation showing a simulated landscape with suitable habitat arrayed in three small blocks. The results are based on 30 simulations. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.*

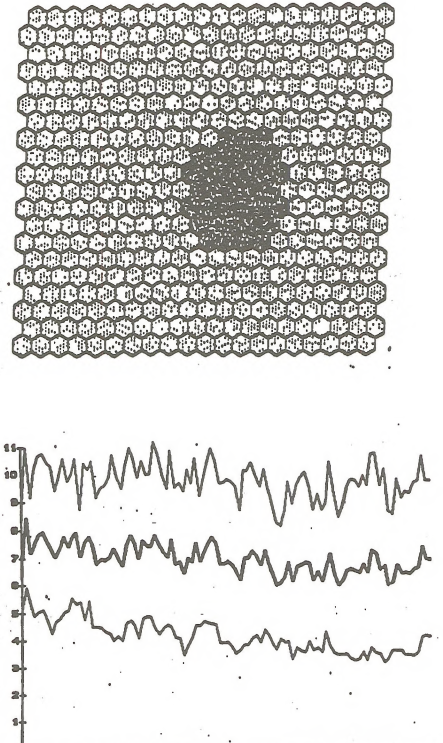
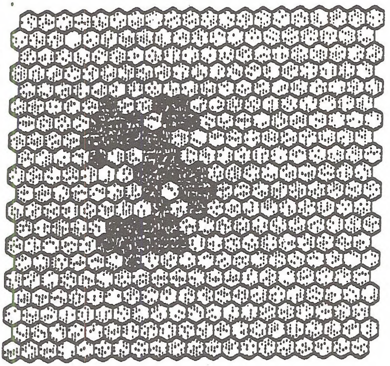


Figure 8. Model simulation showing a simulated landscape with suitable habitat arrayed in one large regular block. The results are based on 30 simulations. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.



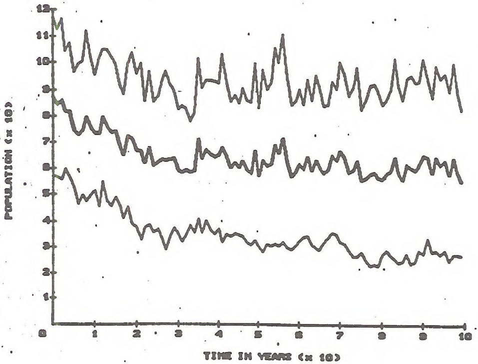


Figure 9. *Model simulation showing a simulated landscape with suitable habitat arrayed in one large irregular block. The results are based on 30 simulations. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.*

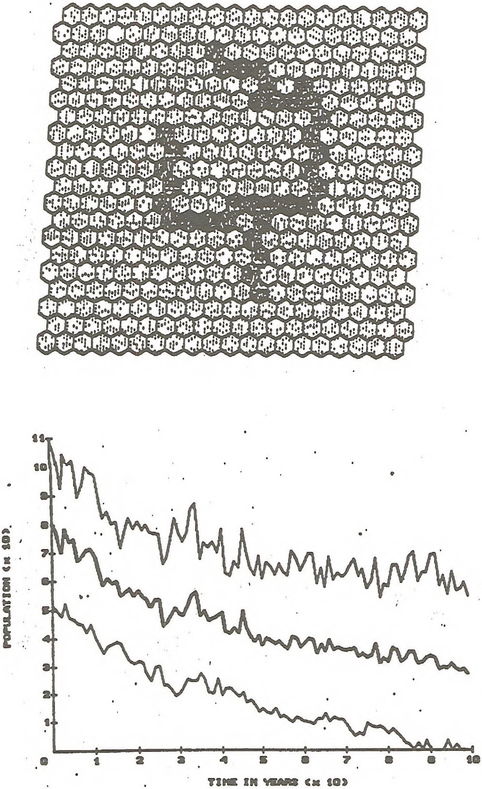


Figure 10. *Model simulation showing a simulated landscape with suitable habitat arrayed in one very irregular block. this block is similar in form to reserves that consist of riparian corridors. The results are based on 30 simulations. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.*

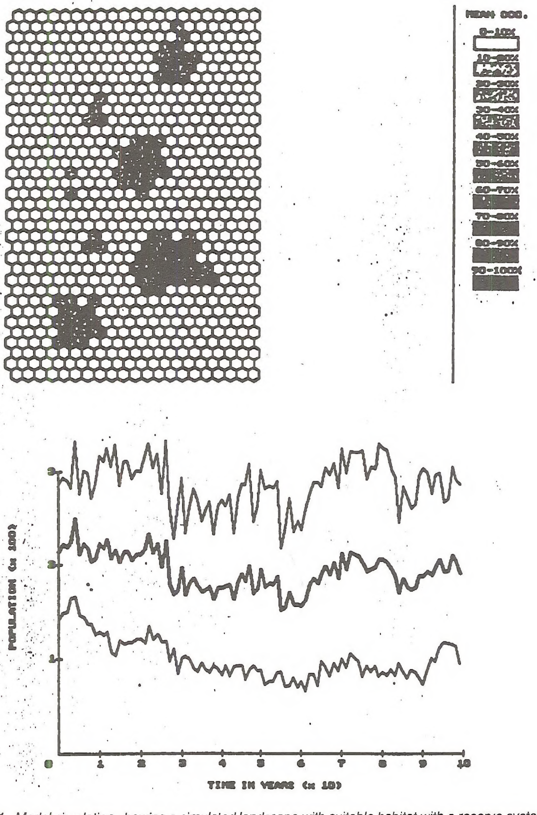
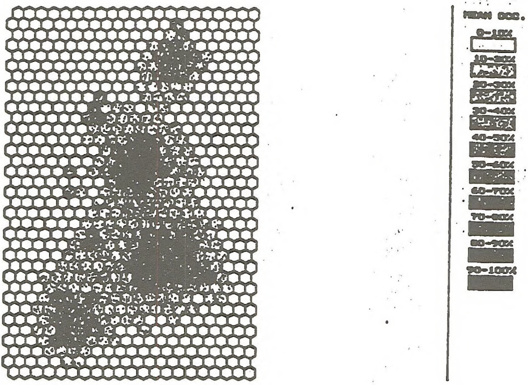


Figure 11. Model simulation showing a simulated landscape with suitable habitat with a reserve system consisting of clusters of suitable habitat surrounded by unsuitable habitat. The population was initialized results are based on 30 simulations. Mean occupancy is the proportion of the time that pairs occupied the site. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.



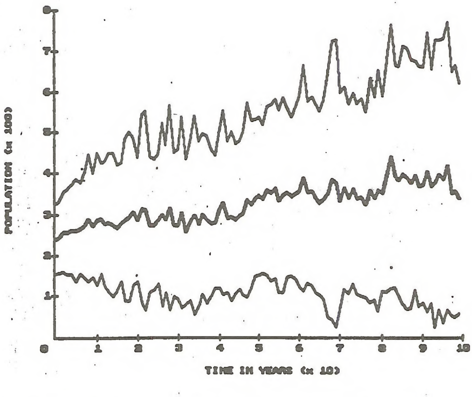


Figure 12. Model simulation showing a simulated landscape with suitable habitat with a reserve system consisting of clusters of suitable habitat surrounded by marginal habitat. The population was initialized results are based on 30 simulations. Mean occupancy is the proportion of the time that pairs occupied the site. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.

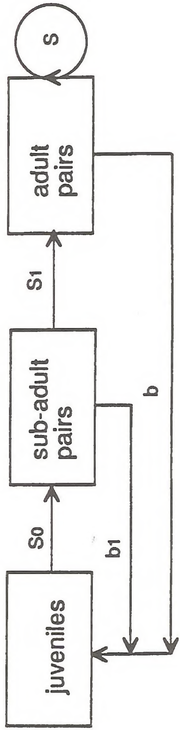


***Figure 13.** A flow diagram representing the life history structure used in s linear stage-structured matrix model.*

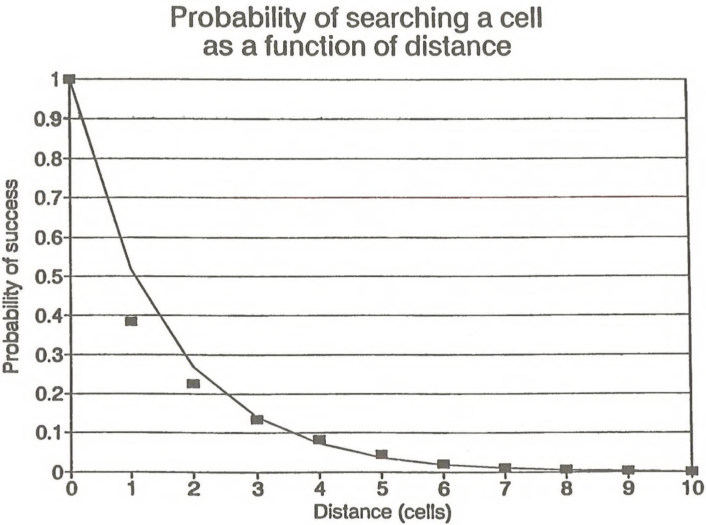


Figure 14. *The probability that an organism searches a cell given 20 searches. The search pattern is a pure random walk. The line is a best-fit exponential function.*

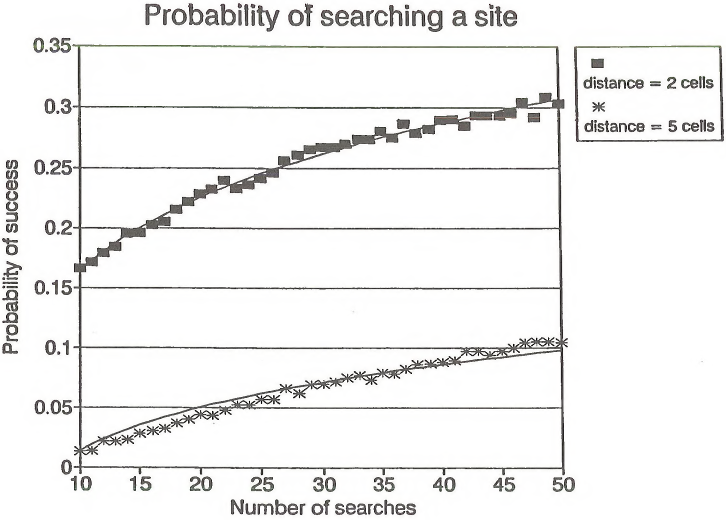


Figure 15. The probability of searching a site, changing the number of searches. The probability of searching a site 2 cells away is greater given 10 searches than the probability of searching a site 5 cells away is given 50 searches.

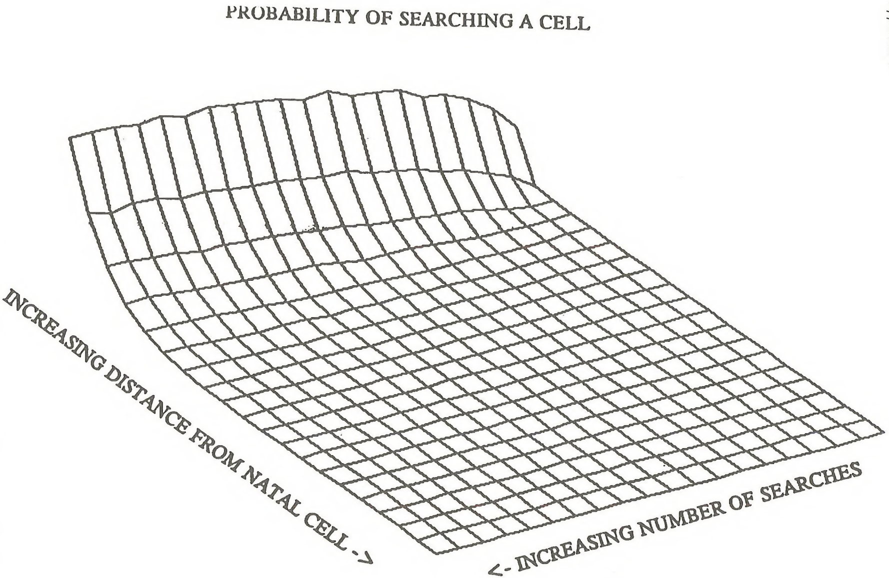


Figure 16. A three-dimensional representation of the probability of searching a cell. Distance from the natal cell dominates the probability function.

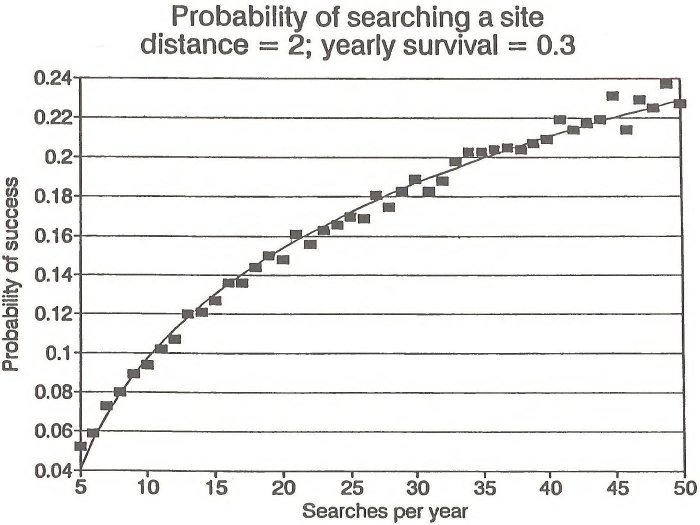


Figure 17. *The probability of searching a site with constant mortality. Here, the yearly risk is pro-rated across the number of steps-per-year. The bird searches until the target cell is found or the bird dies.*

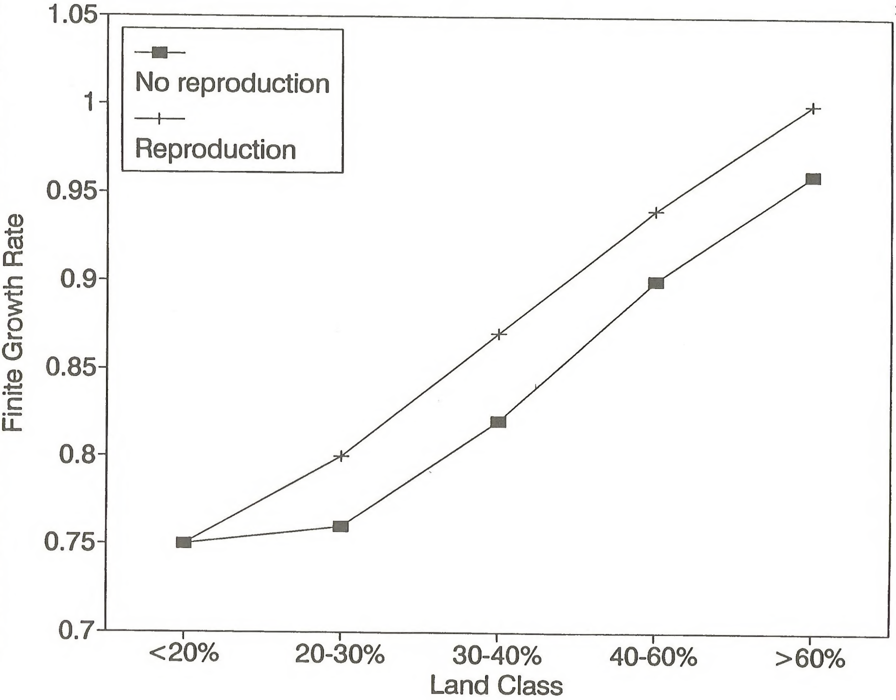


Figure 18. *The modeled finite rate of increase (1) associated with a population of spotted owls occupying habitat having varying percentages of mature forest. Values derived from parameters presented in Table 5.*

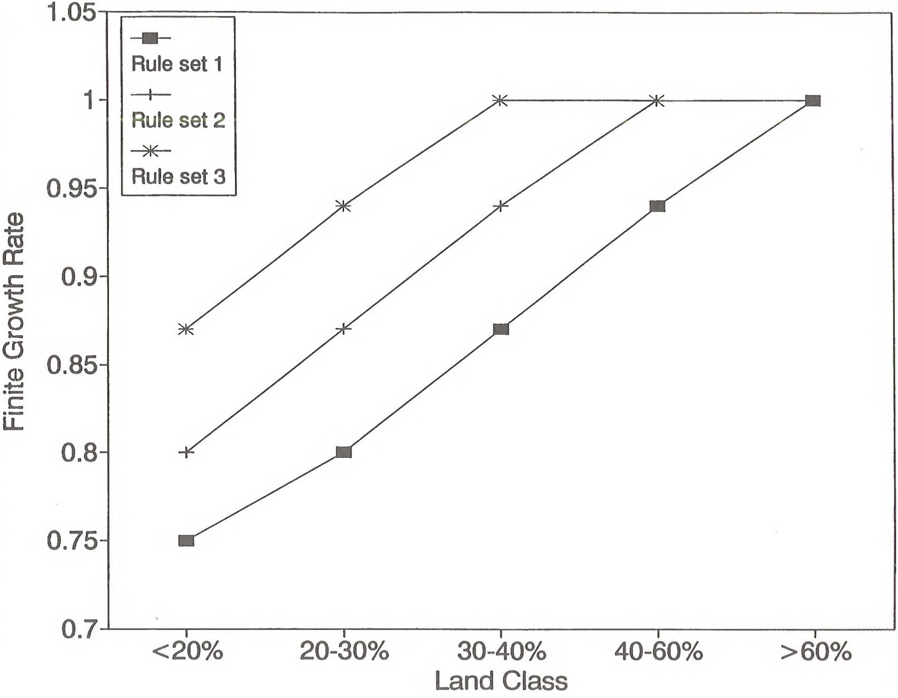


Figure 19. *Modeled l associated with habitat quality. Rule set 3 shows the least sensitivity to the quantity of suitable habitat on the landscape.*

Hexagon Plots for Western Oregon.

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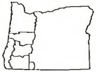

0-100% BLM OWNERSHIP

40-100% OWNERSHIP

60-100% OWNERSHIP

Percent BLM Ownership within 2500 acre Hexagons

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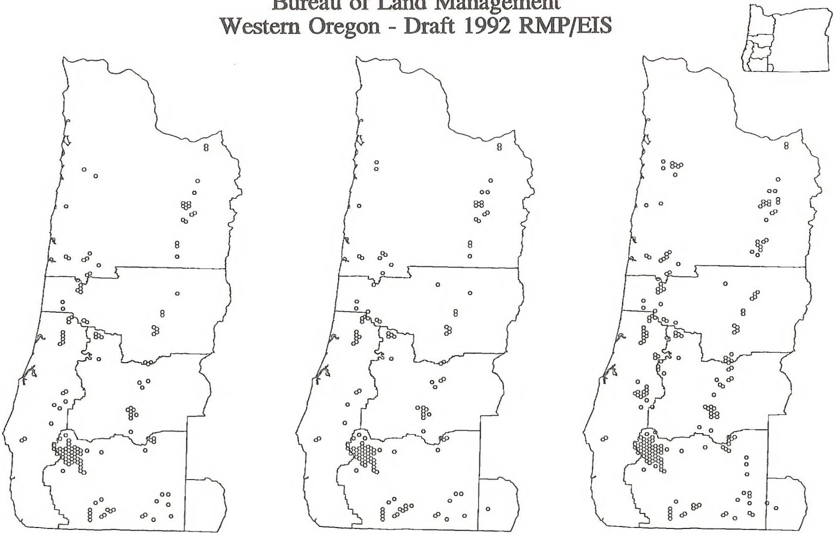

ALTERNATIVE A

ALTERNATIVE B

ALTERNATIVE C

2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 10 Years

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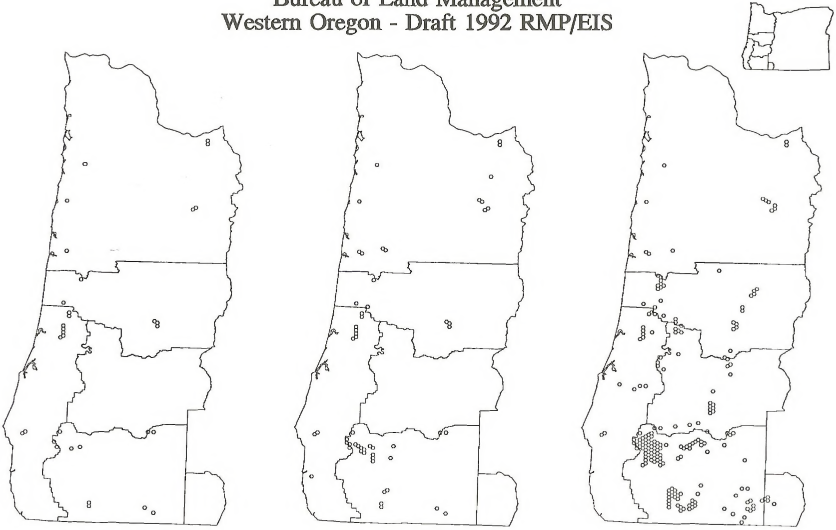

ALTERNATIVE A

ALTERNATIVE B

ALTERNATIVE C *

2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 50 Years

* ALTERNATIVE C - AFTER 70 YEARS

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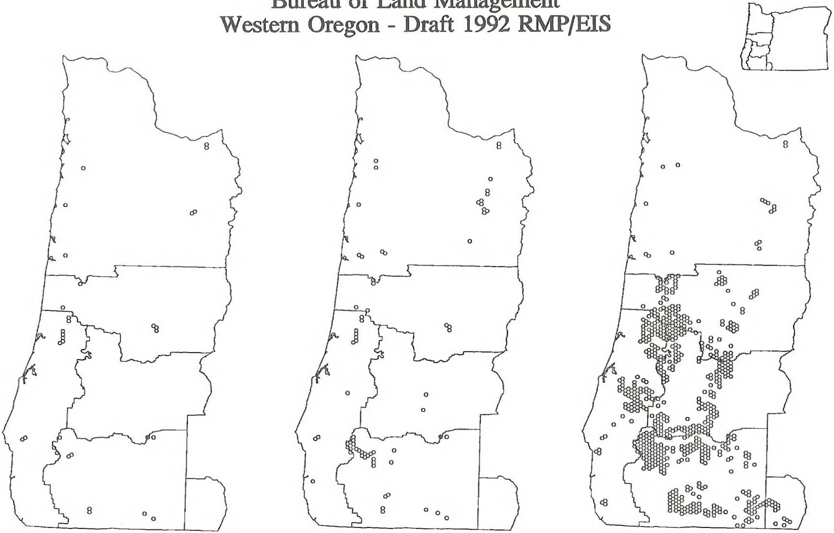

ALTERNATIVE A | ALTERNATIVE B | ALTERNATIVE C

2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 100 Years

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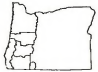

ALTERNATIVE A

ALTERNATIVE B

ALTERNATIVE C

2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 10 Years

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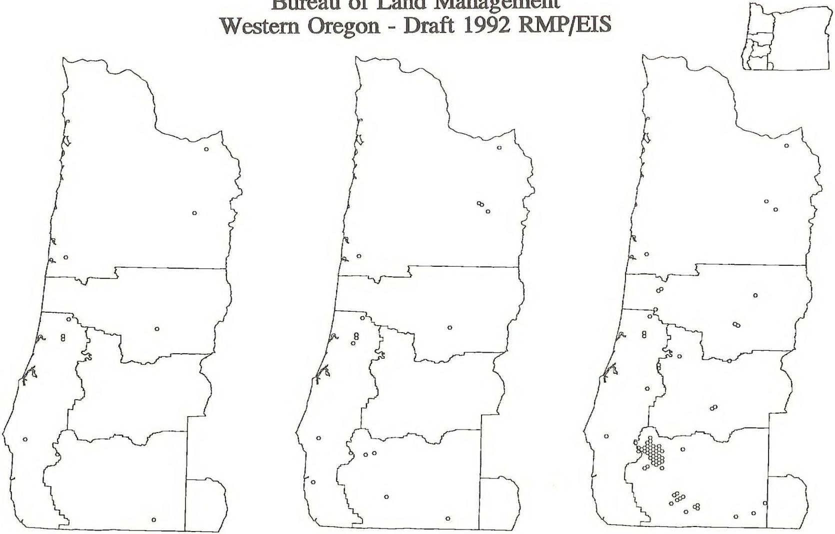

ALTERNATIVE A   ALTERNATIVE B   ALTERNATIVE C *

2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 50 Years

* ALTERNATIVE C - AFTER 70 YEARS

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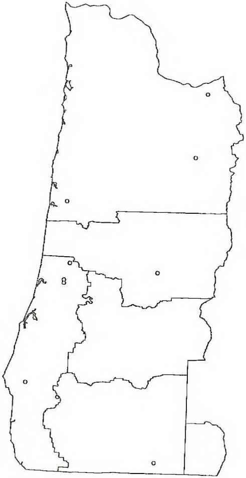
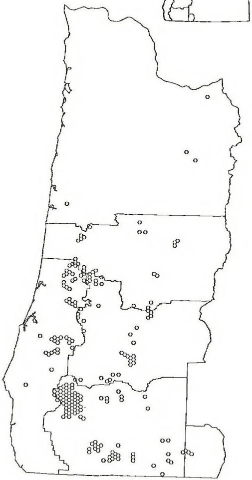


ALTERNATIVE A

ALTERNATIVE B



ALTERNATIVE C

2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 100 Years

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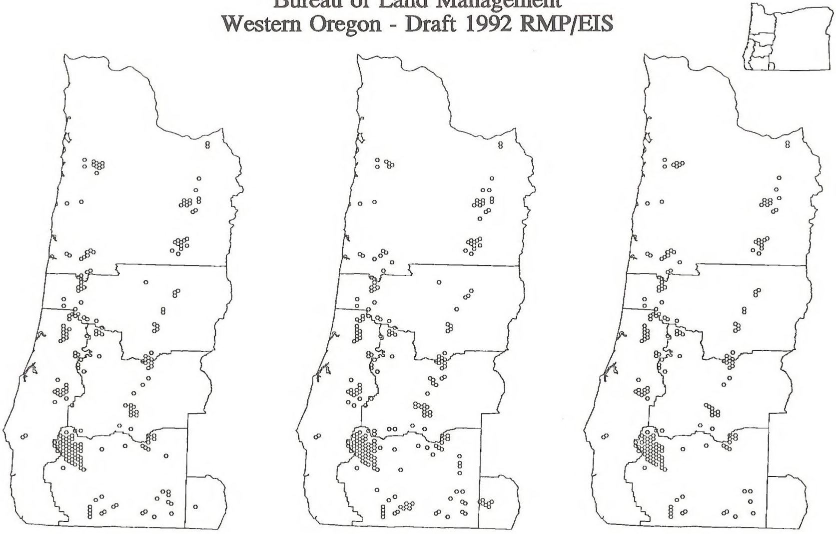

ALTERNATIVE D

ALTERNATIVE E

PREFERRED ALTERNATIVE

2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 10 Years

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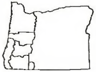

ALTERNATIVE D

ALTERNATIVE E

PREFERRED ALTERNATIVE

2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 70 Years

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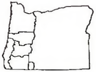
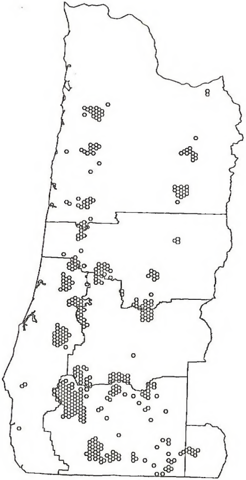
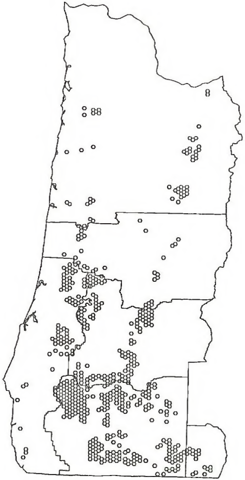




ALTERNATIVE D



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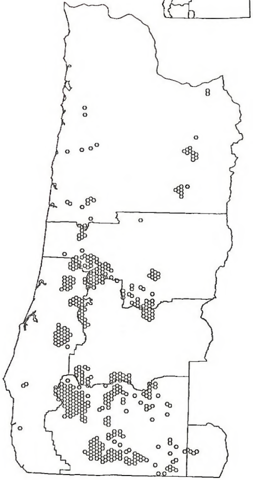
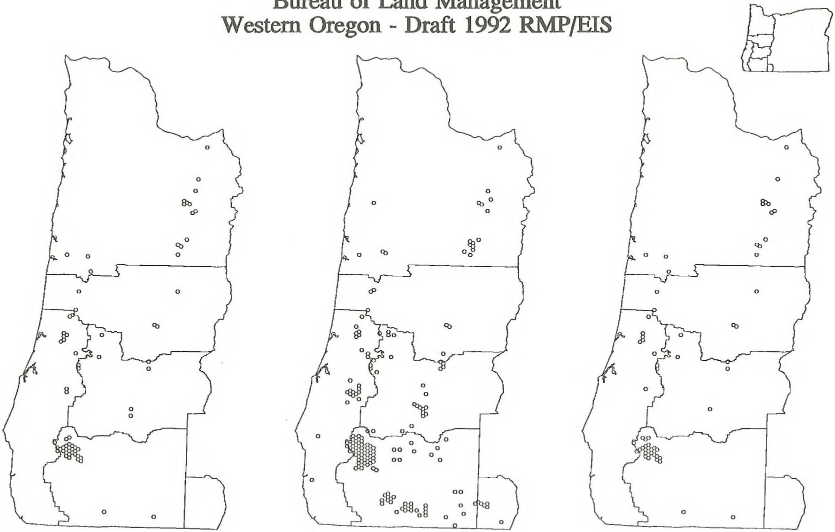


PREFERRED ALTERNATIVE

2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 100 Years

U.S. DEPARTMENT OF INTERIOR

Bureau of Land Management
Western Oregon - Draft 1992 RMP/EIS



ALTERNATIVE D

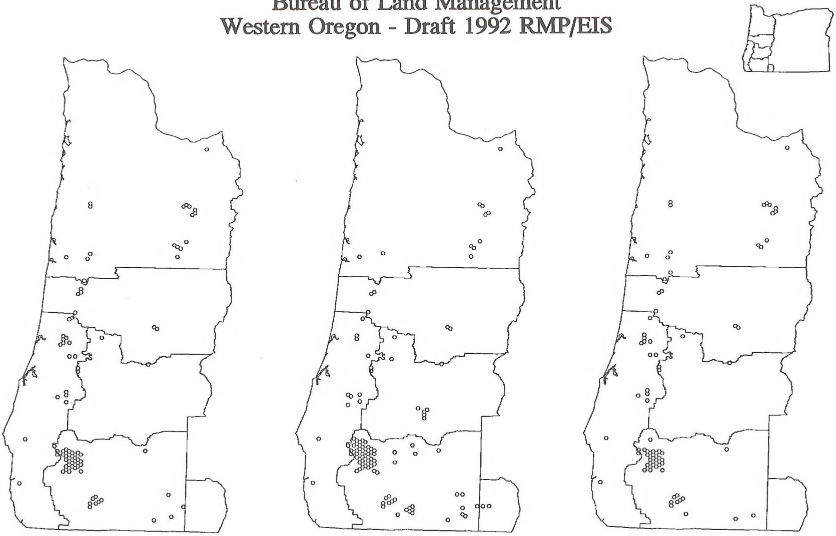
ALTERNATIVE E

PREFERRED ALTERNATIVE

2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 10 Years

U.S. DEPARTMENT OF INTERIOR

Bureau of Land Management
Western Oregon - Draft 1992 RMP/EIS

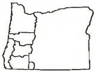


ALTERNATIVE D　　ALTERNATIVE E　　PREFERRED ALTERNATIVE

2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 70 Years

U.S. DEPARTMENT OF INTERIOR

Bureau of Land Management
Western Oregon - Draft 1992 RMP/EIS



2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 100 Years

Appendix 4-F
Management Direction and Consequences of Managing Visual Resources Under Each Alternative

Alternative	Management Direction/Consequences
NA	No areas would be downgraded from old inventory standards. All areas would be managed at Management Framework Plan VRM classification standards.
A	No areas would be upgraded from inventory classifications. VRM Class I No acres of land inventoried as VRM Class I would be downgraded to VRM Class IV and, during the life of the plan, no acres of downgraded VRM Class I land would be harvested at VRM Class IV standards. VRM Class II Approximately 11,700 acres of land inventoried as VRM Class II land would be downgraded to VRM Class IV and, during the life of the plan, would be available for timber harvest. VRM Class III Approximately 30,700 acres of land inventoried as VRM Class III land would be downgraded to VRM Class IV and, during the life of the plan, would be available for timber harvest.
B	No areas would be upgraded from inventory classifications. VRM Class I No acres of land inventoried as VRM Class I would be downgraded to VRM Class IV and, during the life of the plan, no acres of downgraded VRM Class I would be harvested at VRM Class IV standards. VRM Class II Approximately 5,600 acres of land inventoried as VRM Class II would be downgraded to VRM Class IV and, during the life of the plan, would be available for timber harvest. VRM Class III Approximately 28,100 acres of land inventoried as VRM Class III would be downgraded to VRM Class IV and, during the life of the plan, would be available for timber harvest.
C	No areas would be upgraded from inventory classifications. VRM Class I No acres of land inventoried as VRM Class 1 would be downgraded to VRM Class IV and, during the life of the plan, no acres of downgraded VRM Class 1 land would be harvested at VRM Class IV standards. VRM Class II Approximately 1,700 acres of land inventoried as VRM Class II would be downgraded to VRM Class IV and, during the life of the plan, would be available for timber harvest.

Appendix 4-F (cont.)

Alternative	Management Direction/Consequences

VRM Class III

Approximately 18,200 acres of land inventoried as VRM Class III would be downgraded to VRM Class IV and, during the life of the plan, would be available for timber harvest.

D — No areas would be upgraded or downgraded from inventory classifications.

VRM Class I

No acres would be harvested.

VRM Class II

Approximately 34,600 acres would be managed according to VRM Class II standards during the life of the plan.

VRM Class III

Approximately 81,100 acres would be managed according to VRM Class III standards during the life of the plan.

E — All BLM land would be managed to VRM Class III standards or better.

VRM Class I

Land inventoried as VRM Class I would not be downgraded or harvested, and approximately 3,800 acres would be upgraded to VRM Class I.

VRM Class II

Land inventoried as VRM Class II would not be downgraded; therefore no VRM Class II land would be managed at lower standards, and approximately 100 acres would be harvested at VRM Class II standards during the life of the plan.

VRM Class III

Land inventoried as VRM Class III would not be downgraded; therefore no VRM Class III land would be managed at lower standards, however approximately 96,400 acres would be upgraded to VRM Class III, and approximately 300 acres would be harvested at VRM Class III standards during the life of the plan.

PA — Some areas would be upgraded or downgraded from inventory classifications. Areas of BLM land around developed recreation sites and Spencer Creek would be upgraded from inventory standards. Some areas of BLM land within 1/4 mile of rural interface areas and state and federal highways would be downgraded from inventory standards.

VRM Class I

No land has been inventoried as VRM Class I, and no acres would be upgraded to VRM Class I.

VRM Class II

Approximately 33,500 acres would be managed to meet VRM Class II standards during the life of the plan.

VRM Class III

Approximately 81,850 acres would be managed to meet VRM Class III standards during the life of the plan.

Appendix 4-G
Analysis of Alternative Grazing Management in the Klamath Falls Resource Area

Introduction

In Klamath County, production of cattle and calves is a major component of the local economy. Average annual sales of cattle and calves between 1985 and 1989 totaled $36,508,000 (1989 dollars) (Miles 1986-1990). Private lands provide most of the forage within Klamath County. Additional forage on public lands is provided by national forests, national wildlife refuges, and the BLM. The Klamath Falls Resource Area (KFRA) managed 95 allotments for grazing use by permittees. Under existing management 13,869 animal unit months (AUMs) (see Glossary) are offered each year. This is equivalent to an estimated $1,539,800 (1989 dollars) in gross sales of cattle and calves, approximately 4 percent of the total sales in the county. This level of sales generates an estimated $322,400 of personal income (1989 dollars) and 37 jobs in Klamath County. These values include direct, indirect, and respending expenditures made in the county.

Each alternative proposed in the draft Resource Management Plan (RMP), including the No Action alternative, proposes specific numbers of AUMs to be offered annually by the KFRA BLM. The following analysis of the alternatives considers several factors. These include the change from existing conditions (the No Action alternative), in AUMs offered, average length of the grazing season, estimated herd size, the dominance of cow-calf operations in the region and the estimated production function associated with this type of operation, and short-term seasonal constraints. The analysis was conducted using 1989 dollars and all results are expressed in 1989 dollars. The analysis makes no attempt to project future prices for cattle and calves by alternatives. It is assumed that average 1985 to 1989 prices and values represent future prices and values. Historic production, 1985 to 1989, was assumed to represent the level of production expected under the No Action alternative.

Factors Considered

Prices

Prices per hundred weight for cattle and calves are display in table 4-G-1. Nominal prices are from the annual *Commodity Data Sheet* reports (OSU 1987 and 1992). These prices have been converted to 1989 dollars using the implicit price deflators for GNP. The analysis was conducted using the average price expressed in 1989 dollars.

Season of Use

The season of use is the length of time permittees are allowed to run cattle on individual allotments. This is usually defined by specific starting and ending dates on the permit or lease. In the KFRA the existing

Table 4-G-1. Average Prices for Cattle and Calves, Oregon.

Year	Cattle (Nominal)	1989 Dollars	Calves (Nominal)[1]	1989 Dollars
1985	46.50	53.66	59.10	68.20
1986	45.50	51.19	57.90	65.14
1987	57.80	62.94	76.00	82.76
1988	64.00	67.20	85.60	89.88
1989	62.00	62.00	85.60	85.60
Average	53.45	58.75	69.65	76.50

[1]Dollars per 100 pounds

season of use allowed on most allotments includes the spring and early summer months. This typical season is not expected to change under any alternatives, however, the length of the season will vary by alternative. Table 4-G-2 displays the average length of grazing season for all allotments weighted by AUMs.

The average length of season is vital in determining short-term effects. This is because grazing on public lands is only one component of ranch operations. Use of the private property base of each operation and other sources of forage combined with the availability of public land grazing determines the total level of production. In the short term, increases in the availability of public land grazing would be fully utilized and directly increase the production of cattle and calves. Conversely, decreases in public land grazing would directly reduce production of cattle and calves. In the long term the constraints imposed by changes in public grazing would be eliminated as utilization of base properties and other sources of forage change to maximize production given the fixed level and season of grazing available on public lands. The time required to change existing systems of forage utilization would vary by alternative, operator, the assets associated with each base property, and other proprietary information. All changes in systems of forage utilization would likely occur within five years of implementation of an alternative.

Production Function

Among operators using BLM lands to graze cattle, cow-calf operations are most common. The KFRA range conservationists estimates a 10:1 ratio of cow-calf to cow-yearling operations for operators holding permits or leases in the KFRA (Eckard 1992). For this reason, a production function for cow-calf operations in Oregon's south central region was used. Table 4-G-3 displays the types, number (Hewlett et al. 1987), and value of products sold from a typical 350 cow herd. Data on the production function of individual operators in the KFRA is not available. The variety of operation sizes and types is assumed, on average, to be represented by this production function. Estimated gross sales per cow in the herd equals $310.55 (1989 dollars).

Table 4-G-2. Average Length of Season by Alternative in Months.

Alternative	Length of Season
No Action	2.83
A	4.56
B	2.92
C	2.28
D	1.92
E	1.50
Preferred	2,38

Alternative Analysis

Change in Herd Size

Each alternative, including the No Action alternative, proposes a finite number of AUMs to be offered annually by the BLM in the KFRA (see appendix 2-H). The No Action alternative represents a continuation of existing conditions. The change in economic conditions from No Action is estimated for each alternative. Each change in the AUMs offered (increase or decrease) can be equated to short-term and long-term changes in herd size.

In the short term, changes in herd size are a function of the average length of the grazing season. The total change in AUMs for each alternative was divided by the length of the grazing season for each alternative to represent seasonal constraints. This assumes increases in available AUMs would be fully utilized in the short term even if base property and other forage sources cannot maintain an increase in herd size in the long-term. Decreases in available AUMs, could cause immediate reductions in herd size based on the assumption that base property and other sources of forage could not be utilized in the short term to offset decreased AUMs on BLM-administered lands.

In the long term, changes in the AUMs are divided by twelve, representing the total number of cattle dependent on public land grazing each year. Although not a term commonly used, the result represents a change in herd size expressed in *whole-cow-equivalents*. This represents an assumed flexibility and interchangability of forage available from all sources. In the long term this is a valid assumption because the general spring to early summer grazing season on public lands would be unchanged in any of the alternatives. Changes to fall or winter grazing seasons on BLM-administered managed lands would likely invalidate this assumption.

Table 4-G-3. Production, Cow-Calf Operation, South Central Region, Oregon[1].

Product	Quantity	Weight (cwt)[2]	Price per Cwt[3]	Value[3]
Cull Bulls	3	13.0	58.75	2,291.00
Cull Cows	28	9.5	58.75	15,628.00
Heifer Calves	99	4.0	76.50	30,294.00
1st Year Heifers	18	7.1	76.50	9,777.00
Steer Calves	151	4.5	76.50	51,982.00
Total				**109,971.00**
Estimated Sales per Cow				**314.20**

[1]Assumes a 350 cow herd.
[2]Hundred weight.
[3]In 1989 dollars.

Change in Gross Sales

The calculated changes in herd size, for both short and long-term, were multiplied by the estimated value of production per cow in the region ($314.20) to determine the change in gross sales of cattle and calves in Klamath County. Table 4-G-4 summarizes the calculations discussed above for each alternative.

Input-Output Analysis

An input-output analysis was conducted using the BLM's BLMPACT model. This model was developed to analyze the effects of the alternatives proposed in the western Oregon planning process. The model has the capacity to model each western Oregon district and Klamath County individually, as well as the entire western Oregon. For this analysis, only the matrix representing the interaction of sectors within Klamath County was used. The model can estimate changes in personal income and employment associated with several types of BLM management actions at once. For example, changes in grazing and timber management can be modeled simultaneously. In this case, only one BLM management action (grazing) was modelled. Additional information regarding BLMPACT model development, structure, and mechanics is available in the BLM's publications *Per-Unit Expenditures and Fiscal Impacts Reports* and *BLMPACT Reference Manual.*

Table 4-G-4. Change in Herd Size and Value of Production.

No Seasonal Constraints (Long Term)			
Alternative	**Change AUMs**	**Change Herd Size**	**Change in Production[1]**
A	+3,025	+252	+79,205
B	+271	+23	+7,096
C	-1,366	-114	-35,819
D	-2,406	-201	-62,997
E	-4,220	-352	-110,494
PA	-684	-57	-17,909

Table 4-G-4. Change in Herd Size and Value of Production (cont.)

No Seasonal Constraints (ShortTerm)

Alternative	Change AUMs	Change in Herd Size: Average Season of Use	Change in Herd Size: Change Herd Size	Production[1]
A	+3,025	4.56	+663	+208,433
B	+271	2.92	+93	+29,160
C	-1,366	2.28	-599	-188,244
D	-2,406	1.92	-1,253	-393,732
E	-4,220	1.50	-2,813	-883,949
PA	-684	2.38	-287	-90,299

[1]In 1989 dollars.

The estimated short- and long-term changes in gross sales of cattle and calves associated with each alternative was entered into the model. The matrix design of the model causes these changes in gross sales to ripple through the sectors of the local economy creating indirect and induced (respending) effects.

Table 4-G-5 summarizes the total changes in personal income and employment in both the short and long term associated with each alternative. The results are displayed to the nearest $100 of personal income and individual jobs. This level of display was required to capture variations between the alternatives. In general, the effects of most alternatives in the short and long term are of a very small magnitude. The BLMPACT model best estimates changes of larger magnitude than the range of alternatives analyzed here. However, use of the model effectively ranks the level of effects for each alternative and captures the magnitude of difference between long- and short-term effects.

Table 4-G-5. Impacts to Total Personal Income and Employment in Klamath County.

Alternative	Total Personal Income[1]	Total Employment
A	+43,600	+5
B	+6,100	+1
C	-39,400	-4
D	-82,400	-9
E	-186,300	-21
Preferred	-18,900	-2
	Long Term	
A	+16,600	+2
B	+1,500	0
C	-7,500	-1
D	-13,200	-2
E	-23,100	-3
Preferred	-3,800	0

[1]In 1989 dollars.

Cost of Implementing Proposed Range Improvements by Alternative.

Each alternative offered in the RMP specifies a specific program of range development. In general, the cost of installing the proposed reservoirs, spring improvements, fences, and vegetation control and manipulation is borne by the federal government. Once completed, maintenance of the developments is expected

Table 4-G-6. Number and Cost of Proposed Projects by Alternative.

	Reservoirs (Each)	Springs (Each)	Fences (Miles)	Vegetation Control (Acres)	Total Cost (Million)
NA	51	10	39.5	12,450	$1.32
A	55	10	32	12,350	$1.29
B	51	10	32.5	12,410	$1.30
C	51	10	44.5	12,450	$1.34
D	48	10	46.5	12,370	$1.20
E	44	10	42	11,130	$1.20
Preferred	51	10	42.5	12,450	$1.33

Assumes $1,200 per reservoir
$2,300 per spring
$3,000 per mile
$90 per acre

to be completed by local permittees using the allotments (Eckard 1992). Table 4-G-6 displays the number and average cost of improvements by alternative.

Conclusion

None of the alternatives would have a big effect on the general economy of Klamath County. Although overall effects would be minimal, the distribution of effects would be uneven. It is likely that specific ranching operations would be significantly effected. Some operations may not be able to operate profitably and would cease operations.

Local expenditures and employment generated by installation of range developments would offset some personal income and employment losses under alternatives C, D, E, and PA.

Appendix 4-H
Consistency of the Alternatives with State and Local Plans

Introduction

This appendix contains three main sections. The first is a table discussing the consistency of the proposed alternatives with Oregon State wildlife plans. The second section is a table discussing the consistency of the alternatives with the Oregon forestry program. Finally, the third section is a table discussing the consistency of the alternatives with county comprehensive plans.

Table 4-H-1. Consistency of the Proposed Action with State of Oregon Wildlife Plans (cont.)

State Plan or Statute	Objective	Consistency of Alternatives
Oregon Statutory Wildlife Policy, Revised Statute 496.012	Maintain all species of wildlife at optimum levels and prevent the serious depletion of any indigenous species.	Alternatives NA, A, and B could lead to substantial depletion of those populations of species heavily dependent on older forest habitat, that occupy BLM-administered lands in the planning area (See the discussions of threatened and endangered species and sensitive species). Several alternatives could maintain other populations at less than optimum (see the discussion of big game management objectives).
	Develop and manage the lands and waters of the state in a manner that would enhance the production and public enjoyment of wildlife.	Alternatives C, D, E, and PA would provide the greatest enhancement of production and public enjoyment of wildlife.
	Develop and maintain public access to the lands and waters of the state and the wildlife resources thereon.	Public access would be greatest in alternatives NA, A, and B and more limited by road closures in alternatives C, D, E, and PA.
	Regulate wildlife populations and public enjoyment of wildlife in a manner that is compatible with the primary uses of the lands and waters of the state and provide optimum public recreational benefits.	

Table 4-H-1. Consistency of the Proposed Action with State of Oregon Wildlife Plans (cont.)

State Plan or Statute	Objective	Consistency of Alternatives
Oregon Threatened and Endangered Species Act	Protect and conserve wildlife species that are determined to be threatened or endangered.	All state listed species found within the Klamath Falls Resource Area federally listed under the Endangered Species Act. As such, these species will be protected under the requirements and provisions of the Act.
Oregon's Sensitive Species Rule	Help prevent species from qualifying for listing as threatened or endangered.	Most species on Oregon's sensitive species list would not be afforded protection under any of the alternatives unless they are also a federally listed threatened, endangered, or candidate species. Of the *critical* species on Oregon's sensitive list the western pond turtle, Townsend's big-eared bat, and the northern Goshawk are also federal candidate species and would receive the most protection under alternatives D, E, and PA.
Nongame Wildlife Plan	Maintain populations of naturally occurring Oregon nongame wildlife at self-sustaining levels within natural geographic ranges in a manner that provides for optimum recreational, scientific, and cultural benefits, and where possible is consistent with the primary uses of the lands and waters of the state.	See the threatened and endangered and sensitive species consistency discussions.
Big Game Population Management Objectives	Develop, restore, and/or maintain big game (along with associated recreational, aesthetic, and commercial opportunities and benefits) at the level identified in 1980 as the planning target level by the game management unit. This is accomplished through regulating hunting seasons and implementing multiple use management practices that tend to stabilize the cover-forage relationship in space and time, provide for a wildlife emphasis in management of sensitive wintering areas, and offer habitat improvement opportunities on public lands.	Under alternative NA, cover on BLM-administered lands could decline, but would improve in the other alternatives. All alternatives would provide adequate forage and provide for forage seeding. Road closures in alternatives NA, C, D, E, and PA would improve habitat for elk and deer. Most of the alternatives would provide improvement in forage and cover in critical deer winter range. Alternative E would provide the most improvement, alternative A the least improvement, alternative PA moderate improvement, and alternative NA no improvement.

Table 4-H-1. Consistency of the Proposed Action with State of Oregon Wildlife Plans (cont.)

State Plan or Statute	Objective	Consistency of Alternatives
Wild Fish Policy	Protect and enhance wild stocks.	No alternative would change habitat conditions in the short term on already designated streams enough to protect existing stocks with certainty. In the long term, all the alternatives would protect streams sufficiently to protect wild stocks and all but alternatives NA and A would provide sufficient stream habitat protection to contribute to wild stock enhancement.
Trout Plans	Maintain and enhance production.	Similar to wild stocks. See the wild fish policy consistency discussion.
Basin Fish Management Plans	Establish compatible objectives for management of all fish stocks in each basin. Present tasks for attaining objectives, describe unacceptable management strategies, and set priorities on achievement.	Similar to wild stocks. See the Wild Fish Policy consistency discussion. Unacceptable management strategies would be defined mostly by omission. In the future, specific tasks to achieve objectives would be addressed at the activity plan stage.
Oregon Forest Practices Act Rules	Establish minimum standards that encourage and enhance the growing and harvesting of trees while considering and protecting other environmental rsources, such as air, water, soil, and wildlife.	See table 4-H-2, Item 2.

Table 4-H-2. Consistency of the Plan Alternatives with the Forestry Program for Regon (FPFO)

FPFO Objective	Consistency of Alternatives
1. **Forest Land Use.** Preserve the forest land base of Oregon: Stabilize the present commercial forest land base. Manage habitat based on sound research data and the recognition that forests are dynamic and most forest uses are compatible over time.	All alternatives preserve most of the forest land administered by the BLM, while allowing for some conversion of forest to accommodate expansion of transportation, power, and communication facilities. Alternatives NA, B, C, D, E, and PA allow for exchange and/or sale of some forest lands, which could lead to their conversion to nonforest uses if local land use plans permit. Land that would be managed for commercial forest products ranges from a high of 61,306 acres under alternative A to a low of 3,090 acres under alternative E. Only alternatives NA and A maintain at least the 60,465 acres currently allocated to commercial forest production. Alternatives C, D, E, and PA allocate substantial acreage for management of habitats to the exclusion of timber production. The allocation of such land in alternative D is most explicitly based on current research data. All of the alternatives place varying stress on compatibility of forest uses.

Table 4-H-2. Consistency of the Plan Alternatives with the Forestry Program for Oregon (FPFO) (cont.)

FPFO Objective	Consistency of Alternatives
2. **Forest Practices.** Assure practical forest practices that conserve and protect soil productivity and air and water quality. Promote forest practices that maintain Oregon's forest values, including forest tree species, fish and wildlife, soil productivity, and air and water quality. The Forest Practices Act and rules are one vehicle for accomplishing this.	All alternatives provide for the use of practical forest practices that meet this goal and, with some exceptions, meet or exceed the requirements of the Oregon Forest Practices Act and rules and the Oregon Smoke Management Plan. Specific exceptions are: inconsistency of alternatives A and B with the snag/wildlife tree retention requirement; possible inconsistency of alternatives NA, A, B, and C with the rule requiring maintenance of 70 acres of suitable habitat encompassing each spotted owl nest site. Since the 1991 interim rules are scheduled to be superseded by new rules by September 1, 1992, the Preferred alternative for the proposed RMP/final EIS could be conformed to those new rules.
3. **Timber Growth and Harvest.** Promote the maximum level of sustainable timber growth and harvest on all forest lands available for timber production, consistent with applicable laws and regulations and taking into consideration other landowner objectives.	Each alternative provides for the use of intensive forest management practices that are professionally and environmentally sound, to promote timber growth and harvest on all forest lands allocated as available for such intensive management, consistent with the alternatives' goals and objectives. Each alternative considers the application of such practices, even where they may be uneconomic, for the potential purpose of promoting timber growth and harvest.
4. **Recreation, Fish and Wildlife, Grazing, and Other Forest Uses.** Encourage appropriate opportunities for other forest uses, such as fish and wildlife habitat, grazing, recreation, and scenic values, of all forest lands, consistent with other landowner objectives. A full range of recreation opportunities is encouraged. Where needed to reduce harassment and/or overharvest of wildlife, road closure programs are supported. Integration of sound grazing management practices, compatible with timber management goals and wildlife habitat goals, is encouraged.	Each alternative provides opportunities for other forest uses, consistent with the alternatives' goals and objectives. Although all alternatives provide a full range of recreational opportunities, the emphasis of the alternatives varies. Alternative A limits the number of developed recreation sites that would be maintained. Alternatives D and E emphasize non-motorized recreation opportunities. In alternatives C, D, E, and PA road closures to protect wildlife habitat and other values are emphasized. All alternatives provide for integration of grazing management with timber and wildlife management.
5. **Forest Protection.** Devise and use environmentally sound and economically efficient strategies to protect Oregon's forests from wildfire, insects disease, and other damaging agents. Use integrated pest management. Minimize total cost plus loss resulting from wildfire. Employ cost-effective fire management policies that emphasize planned ignition fires over natural ignition fires and that consider effects to the state's forest fire protection program.	Under all alternatives, economically efficient protection strategies would be employed, and integrated pest management would be used. Minimizing total cost plus loss from wildfire would be integral. Planned ignition prescribed fires would be emphasized over natural-ignition prescribed fires, but the latter could be used to achieve resource and fire management objectives. Cooperation with the other fire suppression agencies, including state and local agencies, would help assure cost-effective fire protection and suppression by all parties. Alternatives D, E, and PA provide less efficient protection from wildfire than the other alternatives, however, because of their lower intensity of timber management in rural interface areas there would be an increase in both the risk of wildfire and the cost of suppression.

Table 4-H-3. Relationship of Alternatives to County Comprehensive Plans as They Incorporate and Reflect Statewide Land Conservation and Development Goals

LCDC Statewide Goal Number and Description	Discussion
1. **Citizen Involvement.** To develop a citizen involvement program that insures the opportunity for citizens to be involved in all phases of the planning process.	The BLM's land use planning process provides for public input at various stages. Public input was specifically requested in developing the issues and planning criteria, all of the alternatives, and the analysis techniques described in the RMP/EIS. Public input will continue to be used in the environmental analysis process and development of the final RMP.
2. **Land Use Planning.** To establish a land use process and policy framework as a basis for all decisions related to use of land and to assure an adequate factual base for such decisions and actions.	All of the alternatives were developed in accordance with the land use planning process authorized by the Federal Land Policy and Management Act of 1976 which provides a policy framework for all decisions and actions.
3. **Agricultural Lands.** To preserve and maintain agricultural lands.	The vast majority of public lands in the planning area are not suitable for intensive agriculture. All of the alternatives provide for the continued use of tracts of public lands for agricultural use, either through lease or land sales. The sale or exchange of parcels in land zoned as zone 2 or 3 could lead to new owner requests to Klamath County for non-agricultural (and non-grazing) use of lands previously in public ownership. Since the new owner would be subject to county plan and building permit requirements, including codes and ordinances, it is assumed that the sale of public land and land exchanges would not, in themselves, violate county plans.
4. **Forest Lands.** To conserve forest lands as forest lands and woodlands.	The planning area has significant commercial forest uses. The No Action alternative would retain current management direction with no change in timber harvest levels. The other alternatives would cause a reduction in timber harvest levels but would protect other forest values.
5. **Open Spaces, Scenic and Historic Areas, and Natural Resources.** To conserve open space and protect natural and scenic resources.	Natural and visual resources were considered in the development of all the alternatives. Forest management, under all alternatives, would affect open space as well as natural and visual resources. Adverse effects to visual resources, wildlife habitat, and unique natural areas would be greatest under alternatives NA, A, and B, and least under alternatives C, D, E, and PA (where natural values are emphasized).
6. **Air, Water, and Land Resources Quality.** To maintain and improve the quality of the air, water and land resources of the state.	The federal and state water quality standards would be met and water quality would be maintained and/or improved under all the alternatives except NA. Burning of logging slash and understory burning under all the alternatives could have a slight temporary effect on air quality at upper atmospheric levels. All the alternatives would comply with the statewide Smoke Management Plan.

Table 4-H-3. Relationship of Alternatives to County Comprehensive Plans as They Incorporate and Reflect Statewide Land Conservation and Development Goals (cont.)

LCDC Statewide Goal Number and Description	Discussion
7. **Areas Subject to Natural Disasters and Hazards.** To protect life and property from natural disasters and hazards.	Natural hazard areas, particularly floodplains and areas with highly erosive soils, have been identified. All the alternatives provide for appropriate management of natural hazard areas. Bureau of Land Management authorized developments within natural hazard areas would be minimal under each alternative, with project construction engineering reflecting local conditions.
8. **Recreational Needs.** To satisfy the recreational needs of the citizens of the state and visitors and, where appropriate, to provide sites for necessary recreational facilities, including destination resorts.	The BLM actively coordinates its outdoor recreation and land use planning efforts with those of other agencies to establish integrated management objectives on a regional basis. Under all alternatives, opportunities would be provided to meet recreation needs. The quantity of recreational opportunities would be the greatest under alternatives B, C, D, E, and PA. No destination resort sites were identified on BLM- administered lands.
9. **Economy of the State.** To diversify and improve the economy of the state.	The No Action alternative would induce economic stability or gains in the long term through timber production. Alternatives A and B would induce economic gains if permitted construction of the Salt Caves hydroelectric project occurred and forage for livestock increased. Alternatives C, D, E, and PA would provide lesser benefits through greater diversity of recreation opportunities but diminshed forage and timber production.
11. **Public Facilities and Services.** To plan and develop a timely, orderly, and efficient arrangement of public facilities and services to serve as a framework for urban and rural development.	Public lands could be available for rural or urban development following a BLM land sale or exchange, if the action would be permitted under the local government comprehensive plans and ordinances.
12. **Transportation.** To provide and encourage a safe, convenient, and economical transportation system.	All the alternatives provide for continuation of, and either expansion of or new linear, and aerial rights-of-way for powerlines, pipelines, communication facilities, roads, and other public purposes. The availability of BLM lands would be greatest for these potential uses in alternative A and decrease through alternative E.
13. **Energy Conservation.** To conserve energy.	Conservation and efficient use of energy sources are objectives in all BLM activities. Sale and harvest of minor forest products (such as posts, poles, and firewood) from woodlands and noncommercial forests would be permitted in most areas.

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